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Contextualization in Video Education in Africa: A Participatory, Applied Cognitive Science Approach

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Contextualization in Video Education in Africa:

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by

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ABSTRACT

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This research was conducted to better understand video as a learning medium for adult skill learning in developing nations. It included a Participatory Video project, guiding media creation with Cognitive Science and an experimental study about the effect of the inclusion of contextual information in learning from video. The research was conducted in The Gambia, West Africa, with Gambian collaborators for the Participatory Video creation and Gambian rural women as the experimental participants. In this work, the Participatory Video creation process was shared, including how Cognitive Science research was used to guide it. The second research component used experimental methodology in a rural village to examine how extra auditory contextual information affected learning from video. Ninety-two rural Gambian women saw either a direct version of a video about composting or a version with extra contextual information. Learning was measured through the average number of key elements mentioned during reteaching. The learning was high in both groups, and not significantly different. There was a significant interaction between prior knowledge about composting and video version viewed. Additionally, in the experimental research, qualitative, open-ended interviews were used to examine Gambian attitudes regarding video learning. Villagers valued the access to information, the benefits that access provided, the power it gave them in their worlds, and the visual nature of the presentation. This information can be used to guide a continued video refinement process. All of these components contribute to different fields to improve the overall understanding of video education for adults in rural, developing areas.

Keywords: Video Education, Participatory Learning, The Coherence Principle, Contextual Information, Cognitive Load, Information Access, and Cognitive Science

TABLE OF CONTENTS

INTRODUCTION

Video is a promising learning medium for education in developing countries. The multimedia presentation improves information accessibility, whether delivered via locally available players (such a TV and DVD player) or through the Internet. Video does not require reading; it provides flexibility in learning location and timing; and it works with limited technological infrastructure. These factors meet the challenges of providing educational support for adults in rural, developing areas. The Gambia, West Africa is one such place.

Video presents information through a variety of sensory modalities, which makes it more accessible to people without the benefit of a formal education. The presentation can be more similar to the real world than a simple recitation of information or a written passage. Moreover, many adult learners in rural Africa have little exposure to formal schooling making learning from written material less successful for them (Indabawa & Mpofu, 2006). As a recorded medium, video is flexible with respect to both the location and the timing of learning. While extension workers do come and share skills with villagers, their reach is limited in both scope and attendance (Zossou, Van Mele, Vodouhe, & Wanvoeke, 2009a). Sending a video to a location for viewing at a convenient time is cheaper and more convenient than arranging for extension workers.

Given evidence that video is an accessible tool for learning, it was seen as important to improve access to information through video. To support this, three components of video as a learning medium were examined: 1) learning guidelines derived from Cognitive Science were included in a cross-cultural Participatory Video process to identify techniques for making video accessible to the audience, 2) applied Cognitive Science experimentation was conducted in rural Gambia to better understand the role of information contextualization in skill based learning, and 3) villagers' attitudes about video learning were collected to guide further participatory projects and support video policy development.

First, a Participatory Video-making process was used to create the media for the rest of the research. The creation process used collaborator participation and Cognitive Science research to guide the creation of the learning media. This included two videos about composting, which were used to compare learning based on contradictory predictions about the role of additional auditory information contextualization. One video was a direct version guided by the Coherence Principle, reducing "seductive details" that could interfere with learning the core content (Moreno & Mayer, 2000)—it was limited to a direct teaching of the skill, through modeling of the process. The second video was a contextualized version with additional information about key elements of the process, intended to build a local, shared understanding of the information, taking into consideration the ecocultural environment. This version added nine extra auditory segments to the direct version and extended the length of some of the visual clips; otherwise, the videos were identical. Participant learning was assessed through counting the key elements mentioned during reteaching of the process and answered transfer questions. In conjunction with this, qualitative information was collected to better understand the value placed by villagers on video education. After participants answered learning questions, they answered qualitative interview questions about their attitudes and perspectives on video learning. The information collected from these attitude interviews will be used to further refine the participatorily created video and to gain understandings of possible routes of video distribution.

Participatory Video

The first research component was a Participatory Video-making process that created the media used in the rest of the research. Participatory Video is considered a best practice in the production of videos for development; it is intended to improve video media creation by including audience members in part of the video creation or distribution process (Lie & Mandler, 2009). There are many methods of producing Participatory Video. My research used a modified version of the "zooming in zooming out" methodology of Paul van Mele (2006). First is the "zooming in", at which stage communities are approached to get input regarding their needs. Community participants become collaborators in the video production process. They might be included as collaborators in topic selection, information presentation, identification of misunderstandings, and/or video production. This supports the community and aids in the video creators' understanding of the learning needs being met. The second aspect of the process is "zooming-out": communities are presented with the created learning media and the audiences' input is used to further refine the video creation process and the video distribution process.

The Participatory Video process uses both quantitative and qualitative data collection to develop an understanding of users' needs. The aim of the methodology is to improve video learning media through both the process-based changes developed as a result of the collaborative video creation and the analysis of outcome-based data collected after the media has been created (van Mele, 2006). The norm in this research is to collect data about some combination of: participants' attitudes toward the video, uptake of behaviors shown in the video, understanding of knowledge contained in the video, and attitudes about information distribution (Zossou, Van Mele, Vodouhe, & Wanvoeke, 2009a; Van Mele, Zakaria, Begum, Rashid, & Magor, 2007; Van Mele, 2011). The information learned in a Participatory Video project is shared with other practitioners in a video project review. The reviews describe the collaborative process undertaken, report results of the data collected, and highlight aspects of the project that the researchers found salient for their work. These allow other practitioners to learn from previously conducted research. In my study, the data collected during the interviews of rural villagers in the experimentation aspect of the research also incorporated questions comparable to the norms of Participatory Video so as to be able to contribute to this body of research.

Usually Participatory Video methodology is used in video topic selection, instructional design, and media production. Historically, this has been shown to be successful (van Mele, 2006). However, little research that specifically examines learning from these videos (Lie & Mandler, 2009) has been conducted. One field that has excelled at examining learning from video is Cognitive Science. It has been used to examine the role of video in instructional design for decades, and has established methodologies for conducting this research (Cobb, 1997). If video creation guidelines could be constructed through combining Cognitive Science research with Participatory Video, this could be beneficial in a number of ways: 1) the application of these guidelines could improve the quality of educational videos that are created; 2) methodology from Cognitive Science could provide a structure for the measuring of learning in the field of participatory research; 3) a methodology to experimentally test in the field predictions made by Cognitive Science could be incorporated into the Participatory Video outcome collection. My research attempted to combine these two fields of inquiry. It did this by removing instructional design from the collaborative domain and instead applied research-based Cognitive Science guidelines to the collaboratively determined and produced media creation. In my research I examine whether the Participatory Video process can still create an accessible learning media without collaborators' input into instructional design. This is assessed through measures of learning and qualitative interviewing about information accessibility.

Cognitive Science Guidelines

Cognitive Science research was used to develop video creation guidelines intended to improve learning from video. Learning is cognitive work, and it puts a load on the learner: each aspect of the learning situation comes with its own cognitive costs and requirements, known as a cognitive load (Chandler & Sweller, 1991). Working memory is limited, and if processing overloads the working memory, learning will be reduced. Cognitive Load research attempts to minimize and balance working memory loads to improve learning in different learning situations. The Cognitive Theory of Multimedia Learning (CMTL) looks at how a multimedia-learning situation is shaped by the cognitive load of the processes used during learning (Mayer, 2009). As video is a multimedia source, understanding the role of cognitive loads in video can create improvements in video education. Nine guidelines associated with the loads of learning were derived from Cognitive Science and applied to the creation of learning media in this research: Modality, Contiguity, Transient Information, Attention Constraints, Coherence Principle, Signaling, Congruence Principle, Modeling, and Contextualization. For each guideline used, the guideline is explained and supported with research, and its application is detailed. The effects of these guidelines could not be examined independently, but their shared influence on learning could be surmised through overall measures of learning from the videos and participants' reports of the accessibility of the information presented by the videos.

Differing Predictions Based on Theoretical Perspectives

Most of the guidelines were derived from the CTML, but a few come from other branches of Cognitive Science; for example, the fields of Situated Cognition and Culture in Cognition introduced aspects of ecocultural context into the conceptual framework of my video creation. When these two theoretical frameworks were combined, research questions arose because differing frameworks provided different theoretical predictions about the cognitive load associated with the information organization in the learning media.

The CTML framework supports a coherent process explanation, with no extraneous information, to improve learning from multimedia presentations; this is known as the coherence principle (Mayer, 2009). Extraneous information, if included, might distract the learner from connecting the ideas in the presentation, and could make it more difficult for the learner to learn the steps of the process (Mayer and Moreno, 2002). This effect has been shown in multiple studies (Harp & Mayer, 1998; Mayer, Heiser, & Lonn 2001; Shen, McCaughtry, Martin, & Dillion, 2006). The coherence principle is related to (and overlaps with) the seductive details effect. A seductive detail is interesting information that is included in a learning segment but is unnecessary for the learning objective (Mayer, 2005). Studies of seductive details and the coherence principle examine the learning of the key elements of a lesson, assuming that all groups will define the key elements of the lesson identically. They do not take ecocultural environment into account.

In contrast, the Participatory Video process is an instructional design methodology embedded in the ecocultural context. Collaborators situate the learning media creation in their real world setting to improve the accessibility of the information presented through shared cultural relevance. This approach has also been supported by Cognitive Science research. For example, one aspect of the work associated with learning is the load of creating a shared understanding (Dillenbourg & Bétrancourt, 2006). The more different the perspective inherent in the learning material is from the perspective of the learner, the more work it takes the learner to bridge the gap between those perspectives.

The ecocultural context of learning materials frames the learning for the audience. When a video aligns well with the ways in which the audience thinks, it makes learning easier for the audience (Herrington & Oliver, 2000). For example, a video can be placed in a setting with which the audience is familiar. Doing that would improve learning from the video by making it easier for the audience to relate to the video context (Johnson & Aragon, 2003). Another way to make a video more accessible to an audience is to present the video in the audience's native language. This improves learning by reducing the work necessary to comprehend the learning material (Bello-Bravo & Baoua, 2012). These video alteration methods help audiences, because they reduce the amount of work it takes to understand the video by placing the video in the same ecological and cultural context as the audience. It has been shown that when the alignment between the ecocultural context of the audience and the learning material is improved, the learning material is situated less ambiguously and the learning process is simplified (Lie & Mandler, 2009).

While aligning the method of video presentation with the ecocultural context of an audience is said to improve learning, this learning is currently not being measured in meaningful ways so as to allow for the comparison of learning across methodologies or contexts. The literature review revealed that the information found in the ecocultural environment might be associated with cognitive loads of learning; however, research is currently not being framed in this way in the literature and thus is not adding to that field of understanding.

Historically, many branches of Cognitive Science did not include the study of aspects of the effect of environment on cognitive loads (Choi, van Merriënboer, & Paas, 2014). Initial models of the CTML did not consider ecocultural context in predictions of learning from multimedia sources either (Moreno & Mayer, 2002). For this reason, there remain previously unexplored aspects of how ecocultural context interacts with the cognitive loads of learning. One of these areas is the effect of the information presentation on learning in different ecocultural contexts. Very little Cognitive Science has been conducted in disparate ecocultural context and field-based settings. By conducting a Cognitive Science experiment in a field-based setting, my research contributes to the literature as an example of both possible future fields of research and methodological combinations.

These two theoretical bodies—one based on research into learning from multimedia presentations generally and one based on ecocultural contextualization--would predict different adaptations. The research on coherence principle assumed that learners approach the learning process from the same perspective, while the literature on ecocultural context suggests that rural learner thinking is shaped by the learners' contexts, and that extra contextual information can be used to bridge differences in perspectives. These differing theoretical perspectives were the basis of the experimentation portion of my research. It examined how the intentional inclusion of additional auditory contextual information affected learning from video in rural West Africans. Methodology from the CTML was used to design the experiment, testing two versions of the video against each other in a between-subjects methodology, with reteaching as the primary measure of learning.

If the coherence principle were not affected by the ecocultural context, then it would be expected that any extra-contextual information presented would be seen as interesting but unnecessary: in other words, such information would act as extraneous, seductive details. If, however, the coherence principle were moderated by a load associated with the ecocultural context, then it would expected that extra-contextual information would be neutral in effect, or possibly even helpful to learners in their construction of mental representations of the material being presented.

During the experimental interviews, questions were also included to explore Gambian attitudes about, and valuations of, video education. This was necessary for a number of reasons; 1) it collected qualitative information about the media created using the instructional guidelines to improve the Participatory Video process; 2) it allowed for a richer understanding of video as an educational tool for these participants; and 3) it would provide policy makers and program designers with research-based data to guide and support their work. These questions were primarily derived from other Participatory Video research. However, the questions were framed to collect a richer and broader understanding of the attitudinal aspects of the ecocultural context.

Interdisciplinary Contributions

Overall, this research is important because, while video has been shown to be a very useful tool for providing adults with access to information, there is not enough research into its role in adult learning (Lie & Mandler, 2009). My research contributes to multiple fields. As previously mentioned, there is little research that applies ecocultural context predictions to learning in disparate settings. By conducting experimentation in West Africa, cognitive load aspects related to contextualizations can be examined in ways not possible in traditional laboratory settings (Henrich, Heine, & Norenzayan, 2010).

There are also good reasons to find ways to apply predictions based on Cognitive Science to the creation of learning materials for development. Knowing what information to present to reduce the cognitive load assists in the production of learning materials that make learning easier. Predictions of cognitive processes allow instruction to be adapted for the intended learning needs of the user. This area is underexplored, in part because applying Cognitive Science evidence to real-world learning situations is a complex endeavor plagued with issues of categorization and application. The research in my project has added to the literature a systematic application of theoretical Cognitive Science. This field needs more contributions, and the lack of such research makes this study all the more necessary.

Furthermore, by sharing the research media-making process in a project review format, my research provides examples of how Participatory Video added to the creation of a shared understanding in a skill-based subject. This contributes to the growing number of video project reviews, such as ones studying rice-parboiling techniques for rural farmers (Zossou, Van Mele, Vodouhe, & Wanvoeke, 2009a), seed management techniques (Van Mele, Zakaria, Begum, Rashid, & Magor, 2007), and disease prevention techniques (Bello-Bravo & Baoua, 2012). Participants in those studies thought that the medium was a very effective tool for learning. Given the generally perceived effectiveness of educational videos, more research is needed to ascertain how video content can be made more accessible for different learning groups. This research adds to knowledge fields of video learning for instructional designers, cognitive scientists (particularly applied), and development workers.

Overview of Research

To conduct this research, I traveled to The Gambia, West Africa. In a participatory collaborative process with regional experts in agriculture, two educational videos were created on composting. Both videos were recorded in a local context and dubbed into a local language. One video was designed to adhere to the coherence principle; it presented a simple explanation of the steps of making compost in a sequence that covered all of the key elements for learning but included no extraneous contextual information. The second video was designed to include information contextualization to aid in creating a shared understanding with ecocultural context. Contextual information is any information about a key element in the process that is not necessary for understanding how the key elements relate to one another in the process. Nine reasoning and variation contextualizations were added to the contextualized version of the video. This version of the video was predicted by the coherence principle to impede learning.

The study's participants were 92 adult women from rural areas in The Gambia. Each participant saw one version of the video: either the direct version or the contextualized version. After viewing the video, participants were asked to reteach the information that they had just learned and to answer two transfer questions related to the video. Video reteachings were examined for the presence of key elements necessary for understanding the skill in the reteaching, the correct answers to transfer questions, and the presence of a seductive detail effect. The resulting interviews were examined in relation to these research questions:

1. Does the information contextualization used in the reasoning of the video affect the video learning outcomes associated with the video?

a. Does the presence of contextual information in the video affect the recall of key elements from the video?

b. Does the presence of contextual information in the video affect learning in relation to seductive details?

c. Does the presence of contextual information in the video affect performance on transfer questions?

2. What are participants' attitudes and valuations related to video education? The interview covered aspects of perceived information access, sharing networks, valuations of video education, and video subject presence.

REVIEW OF THE LITERATURE

The body of literature related to video education for adults is not collected into a single field of inquiry (Lie & Mandler, 2009). Rather, articles about video education for adults can be found in journals devoted to a range of disciplines, such as international development, management, educational media, and policy (Van Mele, 2011). Furthermore, there are content-specific journals that publish articles that address educational video based on the video topic. This is particularly common in the health and agriculture sectors. It makes information difficult to compile and compare, and so complicates conducting a rigorous analysis of adult learning from video media. This literature review begins with an exploration of the ways video learning is currently being used in development work so as to better understand the existing fields of inquiry.

One of the primary methodologies used in creating video education for adults is Participatory Video. This methodology uses participant collaborators to refine the learning materials being made. Participatory Video methodology is a good tool for creating culturally relevant media that uses collaborator input to create a strong shared understanding and reduce misunderstandings. These processes support learning from the videos. However, the methodology used to measure the extent of learning from these videos has been inconsistent.

Video learning has been studied extensively in Cognitive Science (Mayer, 2009). Historically, though, there has been little overlap between the Cognitive Science research on video education and the Participatory Video work on video education. These fields have information and tools of application that might be meaningful to combine. The present research is an attempt to combine these research approaches to improve the accessibility of information that is presented in videos, to strengthen the rigor of information collection by introducing interdisciplinary methodological combinations, and to add to the field of Cognitive Science by conducting field-based experimentation in West Africa. This study used multiple lenses to frame the information obtained in meaningful ways for different audiences. Three primary areas of interest were examined in regard to video educational media: 1) improved video creation techniques guided by Cognitive Science, 2) the role of auditory information contextualization in learning from a skill-based educational video, and 3) villagers' attitudes towards video learning, for development workers working to build or improve educational video projects.

The media created in this project used modified participatory research to develop the learning materials. In addition to this, Cognitive Science research was used to create guidelines for video creation. In the research process, theoretical frameworks were selected and combined to provide the right tools to answer a diverse collection of questions about video learning media. When questions arose about the most appropriate guidelines to choose in relation to informational design, two recommendations were tested against each other. During the conducting of the Cognitive Science experimentation, qualitative information about villagers' attitudes toward video was also collected. This chapter provides both the theoretical and the methodological background that was integral to the design and implementation of this study.

Video as a Tool for Adult Education

In thinking about improving video as a means of adult education in Africa, it is important to first explore the field of video in development. Video is used for multiple purposes in development work, only one of which is adult education. In adult education, videos are used to give practical instruction, aid in the adoptions of good practices, and share local innovations. While these videos can come in many formats, they are generally based in local contexts, involve local experts, and are used for increasing knowledge or skill learning (Lie & Mandler, 2009). Video allows for the customization of the training, both culturally and cognitively, for the specific audience being targeted.

The agriculture sector is one context in which video education in rural adult populations has been studied extensively. A meta-analysis has consolidated this information for development providers (Van Mele, 2011). The data for this study was collected through the author's personal fieldwork in both Africa and South Asia, and through an on-line survey of over 500 field professionals. These professionals were primarily from agriculture extension programs in Africa, Central and South Asia, and Latin America. The field experts answered questions about the utility of video for agriculture education in development work, based on their experience in the field.

Many of the findings from this study are relevant to video education in general, beginning with the utility of video: 78% of participants had used videos to train farmers, and about 50% of the professionals looked at videos to get new ideas. Videos were valued as useful for reaching specific populations, such as the illiterate, youth, women, and social groups. The survey also provided guidelines for video creation: 85% of respondents saw local language videos as very important, as was having farmers demonstrate the skills in the videos. Making the videos of a suitable length was also seen as important—between 5 and 15 minutes long was seen as ideal, though it varied with the complexity of the subject being presented. These guidelines were followed in the creation of learning media for my research.

Bangladesh seed video research. One of the most-studied video education projects dealt with seed education in Bangladesh (Van Mele, Zakaria, Begum, Rashid, & Magor, 2007). In 2003, researchers introduced a video series about rice management. The video series covered the topics of seed sorting, seed flotation, seed drying, and seed storage. These videos were made as part of a participatory process, in which four videos were developed with 42 knowledge, attitude, and practice statements incorporated into the instruction. Participants were included at multiple points in the video development, and reviewed iterations of the presentation for relevance and clarity.

When participants were surveyed in 2005, the videos were seen as very effective for learning. In a survey of 1,252 women from multiple villages in the area, many of the women had adopted the new techniques seen in the videos. For example, seed sorting had been adopted by 24% of viewers, and seed flotation with salt had been adopted by 31% of viewers. More than 70% of the women said that the videos had improved their seed drying skills, and one seed storage technique had been adopted by 91% of viewers. This study measured the video's effectiveness based upon adoption of process and responses to open-ended questions. This is a common method of measuring video impact, and in many cases adoption of a process is the intended outcome, so it is the only measure of learning used.

Follow-up research on the same video project involved the return of researchers three years later to look at the changes in human capital created through use of these videos (Chowdury, Van Mele, & Hauser, 2011). To do this, they randomly selected 140 female farmers from 28 villages in which the program had operated. Forty women from four control villages that had had no access to the project videos were compared to the group with access to the videos. Data was collected by way of focus groups, behavioral observations, and individual interviews. Results compared measurements from 2005 and 2008. They measured demographic information, rice and seed production statistics, gender and intra-household decision making, social and human capital, and communication with local seed information sources. Women reported viewing the videos in various locations an average of 6.2 ± 1.7 times. The results indicated that the video-mediated group learning sessions helped farmers understand new techniques, understand why they were doing things in new ways, and innovate in other areas. It also increased knowledge sharing with others in the community. The video-mediated group learning did more than just improve individual female farmers' farming abilities; it also created new learning communities and stimulated network building between neighbors.

In Bangladesh, the video creation process surrounding seed management showed how transformational participatory educational projects were for the stakeholders in the process and how beneficial the outputs could be for communities. (Chowdury, Van Mele, & Hauser, 2011; Van Mele, 2006; Van Mele et al., 2007).

Funds of knowledge. The concept of "funds of knowledge" refers to how knowledge, such as household practices and local traditional practices, can be used as a form of cultural capital that can be bartered and exchanged within and among communities (Moll & González, 1994). These funds can be seen as both social and cultural capital (Rios-Aguilar, Kiyama, Gravitt, & Moll, 2011). As social and cultural capital, it has been argued that these funds of knowledge can be converted to other types of capital, including economic capital (Bourdieu, 1986). One aspect of my project was the attempt to convert the funds of knowledge in traditional and ecological areas that were possessed by expert collaborators into possible social, cultural, and/or economic capital that could be transferred to a large audience at a low cost. Previous video research has shown that video education allows for this.

In terms of the cost of the video creation versus the possible economic benefits in capital change, the seed video endeavor was seen as a good economic investment. Initially, 700 copies of the videos were distributed to organizations at a communication fair. Two years later, records showed more than 1,400 video showings had been organized from those copies. This seed management series reached about 131,000 farmers. An estimated gain of the video-based training was calculated in 2007, using an estimated increase of 5% in rice yield from improved practices, divided by the cost of making the films. At the time of the paper, the estimated gain was at least 17 times the investment cost (Van Mele, Zakaria, Begum, Rashid, & Magor, 2007). In the discussion of socioeconomic benefits, this model provided an estimated cost of video creation and distribution compared to the economic benefits derived from the video learning. The model results aligned well with the study participants reported perceptions of the economic benefits received. This further strengthened the argument for the use of the Participatory Video practice.

Knowledge equity. Another example of how useful educational video could be was provided by a study comparing conventional community workshop-based training with a video created in Benin about rice parboiling (Zossou, Van Mele, Vodouhe, & Wanvoeke, 2009a). The conventional training comprised a two-day community workshop in which experts demonstrated the process of improved parboiling to women. The video being compared to the conventional training was a video produced by farmers discussing how parboiling improves rice and demonstrating techniques for successful parboiling. Researchers interviewed 160 women individually, as well as 17 women's groups. Data collection included observation, photographic records, interviews, and group discussions. The results revealed that video was more successful than the workshop in a number of ways.

In terms of educational reach, the farmer-created video reached 74% of the women parboilers surveyed, as compared to only 27% of the professional parboilers who had attended the conventional training. Another advantage of the videos was that all the community received the same information at the same time, which allowed for a more egalitarian ownership of knowledge. The videos seemed to stimulate information sharing and social networking. Furthermore, the videos reduced the bias associated with the selection process for conventional training. In conventional training, social connections sometimes led to the selection of training participants based on social ties, and ignored other women who could have used the training (Zossou, Van Mele, Vodouhe, & Wanvoeke, 2009b).

The case for video. These studies, and others, have shown success in using video education both in Africa and in other parts of the developing world. They also provided guidelines for my research. They revealed best practices for video creation to make a video that is well-liked and likely to be adopted by communities, and they described situations in which the video projects were seen as less impactful. The videos that were most successful had some specific traits in common. First, the videos that allowed for some flexibility of practice ended up with better overall adoption of practices (van Mele et al., 2007). Second, successful projects were translated into local languages to allow egalitarian access to the video. Even though a video made in a completely different culture could have educational value if the conditions were similar enough to those in the targeted community, having the video accessible in the local language was necessary for large-scale practice adoption (Van Mele, Wanvoeke, & Zossou, 2010). Most importantly, the producers of successful videos worked with the people for whom the videos were intended, to make the videos accessible to the people who would use them; they allowed contributors a voice in not just what was to be taught, but in how it would be taught, as well (Van Mele, 2006); and they allowed people to be experts in their own areas and to have ownership of their projects (Odutola, 2003). Using participants as collaborators in the video creation process is known as Participatory Video. Participatory Video has a variety of applications and is not restricted to capacity building; nonetheless, in the international development sector, it is the primary approach to the video creation process when designing skill-based training videos for adult learners.

Participatory Video

Participatory Video is a development tool created to bring about positive social change and empower marginalized groups (Lunch & Lunch, 2006). This research approach uses a collaborative video creation process to engage and mobilize communities. The video product outcomes of this work differ depending on the purpose of the project; some examples are videos that share knowledge, videos that communicate needs to decision-makers, and videos that tell stories. Participatory Video is a practice-based methodology that has its roots in agriculture extension (Lie & Mandler, 2009). Its strength is in identifying issues in the community in order to provide the intended audience with community-led learning. As described in the previous studies, it is seen as an effective means of social impact, having socio-cultural benefits that extend past just the information contained in the video, to a commodification of that information in multiple forms. These range from physical economic benefits and increased innovation (Van Mele et al., 2007), to more social networks and increased perceptions of equity and empowerment (Chowdury, Van Mele, & Hauser, 2011).

Participatory Video is regularly used for the training of skills, but research in the field is focused more on the social processes and on coordinating community change than on the specific learning processes invoked by the media being created. As a result the quality of videos produced for purposes of research can vary greatly (Lie & Mandler, 2009). These differences are hard to assess, because not all studies based on participatory processes use are interested in learning outcomes related to the created media. The following section will discuss a few different Participatory Video processes used in the creation of training videos. This will be followed by a review of how information is being measured within these studies and the different learning outcomes associated with these measurements.

Benefits of collaboration. One example of a Participatory Video project involved a tuberculosis education video created in The Gambia, West Africa, the country in which my research was also conducted (Martin, Brookes, Cham, Sowe, Khan, Thomas, & Hill, 2005). Researchers worked with Gambians to plan, write, shoot, edit, and show educational videos about tuberculosis to increase villagers' awareness about the disease. The primary area of interest in this research was a qualitative understanding of how the collaborative process benefited participants. All of the emergent themes in the results supported the concept of empowerment of collaborators through the Participatory Video production. The project was seen as very successful, and it did increase both the collaborators' and the viewers' knowledge of TB (Martin et al., 2005).

The research provided strong support for the employment of some sort of participatory film creation methodology in terms of perceived socio-cultural benefits, but it did not provide an in-depth measure of the learning actually derived from video viewing.

Learning measures were collected via open-ended focus group questions that primarily explored how the video could be improved, as part of the Participatory Video methodology.

Zooming-in zooming-out. The majority of the previously discussed studies included media created in collaboration with Paul Van Mele. His video production technique is grounded in a Participatory Video methodology that he created, called "zooming-in zooming-out". He recommends this technique for adult skill-based learning (Van Mele, 2006). The zooming-in zooming-out approach starts with a multi-stakeholder consultation process to define regionally relevant needs. Afterwards, deeper examination is explored with a small number of communities to understand their current understandings and innovations with the subject. This leads to the development of the exact content of the video. The zooming-out process is when this content is scaled up and fine-tuned to the larger community. This is a data-driven process, in which videos are introduced to a community and then assessed in the field. This allows the impact of the video to be measured through multiple methodologies, both quantitative and qualitative. The information derived from this process is then included in further project analysis in hopes of improving the learning media and its distribution. Paul Van Mele has applied these techniques to the studies he performed first in Bangladesh and then globally. While not all Participatory Video making uses this zooming in zooming out methodology, the studies that have included it have argued that the methodology was an important aspect of the projects' success (Chowdury, Van Mele, & Hauser, 2011; Van Mele, 2006; Van Mele et al., 2007).

Farmer-to-farmer. Not all videos created as Participatory Video projects have been seen as equally successful learning tools. For example, one common participatory technique used in the creation of agricultural training videos is the Farmer-to-farmer film approach, in which films are made by farmers to share farming techniques and innovations with other farmers. The utility of these films as learning tools was called into question in a study by researchers Kumi & Kumi (2012). Their study examined the effectiveness of farmer-to-farmer training films in Ghana. Kumi and Kumi measured learning from a film about pruning mature cocoa trees from the cocoa farmer-films collection, using a 28-member farming group (19 women, 9 men) as participants. After the viewing, each farmer was interviewed about their understanding of the video and what they remembered. Results showed a low rate of retention of the intended learning materials. The learning goals included learning 9 images, 12 learning points from the narration, 9 colors, music, and 9 objects. The average participant remembered 2 images and 3 facts from the narration. Furthermore, when behavior change was measured, conflicts with societal gender roles prevented the viewers from seeing the videos as applicable to themselves, because the videos advocated that women do what was perceived as men's work. In the behaviors that farmers did attempt to modify after viewing the video, they often did not perform the learned task in the way it was taught. Instead they used alternative tools and equipment.

In order for a video education system to be successful, it needs to be seen as a useful tool by the people who will use it. In the case of this video, that was not the case. The authors attributed participants' poor performance in part to the lack of adequate instructional design in the farmer-films, and suggested that this might be the case in other participatory made videos. Unlike the studies previously discussed, the farmer-to-farmer films study was testing media that had not been created by the researchers themselves, and was specifically investigating the learning from the medium instead of the participatory process to make the video.

The intended goal of the farmer-to-farmer films study was to measure learning from the video presented; however, the assessment methodology used to measure the learning in the study was not well-reported. The study participants scored low on retention of the learning material. (Kumi & Kumi, 2012). The scores were so low that they called into question the researchers' methodological choices for measuring learning, not just their explanations of the learning from video. The researchers questioned participants—ostensibly to identify how well participants learned facts from the video—however, the interview methodology was not well communicated. Regardless of the overall quality of the farmer-to-farmer films study, the proposition that it would be beneficial to have better methods of measuring learning in Participatory Video is reasonable. Current measures of learning are often broad and not generalizable, which makes further analysis difficult.

Participatory Video reporting. With its roots in applied development work, the Participatory Video approach is not reported in a traditional research manner. Instead, most Participatory Video project review articles are written to share the learning process with other practitioners. To do this, the reviews include detailed accounts of the participatory process, including what aspects of the process were participatory and how the creation process proceeded. Additionally, because Participatory Video's roots are in enabling social change, the measures of learning outcomes are often related more to attitude information and behavior change than knowledge acquisition.

Measuring learning outcomes. A review of video in development studies reveals that participatory research comes in many formats, and involves contributions from participants at a variety of stages in the process. Depending on the study, contributions might be requested in determining video topics, identifying key elements of the learning, scripting out the process, determining what is culturally relevant, and determining how to distribute videos. Different kinds and levels of participation support a variety of learning outcomes associated with video education, such as sociocultural outcomes, skill adoption outcomes, and knowledge acquisition outcomes.

Much of the previous research has been focused on sociocultural learning outcomes and funds of knowledge. This research has found that a high degree of collaboration allows participants to feel empowered and given voice (Chowdury, Van Mele, & Hauser, 2011). In some of these projects, such as the TB study in Gambia (Martin et al., 2005), the sociocultural aspects of the process are the only learning outcomes assessed to any depth. In contrast, the rice studies in Bangladesh focused on change in attitudes, knowledge, and practice following the viewing of the videos. Attitude information was collected in focus groups. Data regarding changes in practice was collected through individual interviews. It was measured with a: yes, no, or I don't know response. Participants' change in knowledge was measured with transfer-style questions that called for participants to share what they recalled in relation to the information presented in the videos watched, such as "Do you know what causes holes in the seed?" (Van Mele, Zakaria, Begum, Rashid, & Magor, 2007). The attitude information that was collected related to the sociocultural learning outcome goals of the project, while the knowledge and practice information was more related to learning outcomes measured by practice adoption and knowledge acquisition. The sociocultural learning outcomes and adoption outcomes were adequately assessed, but the measurement of learning based on a participant's retrieval of the correct information is still rather a broad measure of learning that cannot easily be refined. Measures of learning derived from Cognitive Science could be a good contribution to what is currently used in the field. Cognitive Science has regularly been used to examine learning with study participants, and in this process reliable measures of learning have been derived and validated across many learning formats.

There is not a large body of research about video education using adult learners in development work (Lie & Mandler, 2009). In video project reviews and studies conducted about Participatory Video, the focus of the field has been on processes of building learning material that are cross-culturally relevant and empower the learners to create change in their communities. As more video education becomes available for adult learners, the accessibility of the information content of video and the format of the information presentation become more salient. While it is still important that the videos are cross-culturally relevant and that they empower learners, the instruction within the videos should have learning outcomes associated with the learning process itself. The field of Cognitive Science has produced is a good deal of educational research about how people learn from video. It has developed research into improving video to aid learning and into ways of measuring learning in video. Combining Cognitive Science methodology with Participatory Video methodology is a contribution to both fields. As further discussed in Chapter 4, in the case of my research, Participatory Video methodology was included in topic selection, identifying the key elements of learning, determining what would be culturally relevant, assessing attitudes related to video, and developing an understanding of community video preferences. Cognitive science research, instead of participatory suggestions, was used to guide the instructional design process in media creation and the experimental methodology used in the field-based video assessment.

Cognitive Load in Video Design

Video is a complex educational medium that incorporates a large amount of both visual and auditory information for the learner (Mayer, 2003). This provides a large amount of information to be organized and integrated for learning to occur. Processing this information will produce a cognitive load for any learner (van Merriënboer, Kester, & Paas, 2006). Furthermore, because there is not an instructor present, video does not incorporate feedback as part of the learning process. From a cognitive perspective, this lack of feedback adds to the learners' load, because it makes it difficult to reduce learners' uncertainty about the material presented, and makes them responsible for the work of organizing a mental representation of the material. Understanding the way in which instructional design interacts with cognitive load can allow for the creation of learning materials that increase the chance of learning for the learner.

Memory. Models of memory are built on the foundational proposition that, in order to learn new information, the learner needs to interact with that information and store it for later use. The long-term memory is used for information storage (Repovš & Baddeley, 2006). It is regarded as unlimited--both in the amount of information that it can hold and in the duration for which it can hold that information. Working memory, on the other hand, is what allows for focus of attention, interaction between world perceptions and knowledge schemas, and incorporation of information together (Logie, 2011). Working memory has been shown to be exceedingly limited: it can hold only a limited amount of information at a given time; and any information interaction takes effort, known as cognitive load. Without effort being expended, the duration for which a piece of information will remain in working memory is less than 30 seconds (Repovš & Baddeley, 2006). Chunking of information allows people to work with more information, even given the limited capacity of working memory. Conceptual information is chunked together into frameworks; in this way, very complex information can be manipulated together. It is stored and related to as one piece (Paas & Sweller, 2012). This is important in relation to cognitive load because the interactions of chunks require cognitive effort and create a cognitive load. Automation is a third aspect that drives working memory limitations. If a skill is practiced, it can become automated. This means that the task no longer requires conscious effort to be performed. Automation has been seen across cultures and tasks (Buchtel & Norenzayan, 2009). Automation of part of a thinking process can reduce the cognitive load associated with the task. These three aspects of working memory guide how new information is acquired and interacted with across all humans (Norenzayan & Heine, 2005). Understanding how they relate to a learning task can allow the task to be planned with an amount of cognitive load conducive to the intended learning.

Cognitive Load Theory. Working memory is the bottleneck at which learning can often fail, given its limitations. Cognitive load theory is an approach to learning based on exploring the limitations of different domains of working memory to try to improve learning (Paas & Sweller, 2012). Since working memory has an overall limit for different tasks, when a learning situation is being planned, planners must keep in mind that any one part of the learning situation might consume large amounts of the working memory. To explore these cost-benefit aspects of working memory limitations, three theoretical categories of processing have been defined: 1) intrinsic cognitive load (the load necessary for performing a task); 2) extraneous cognitive load (additional load created due to mismatches in the learning goals and the teaching methods); and 3) germane cognitive load (the load associated with integrating ideas and connecting conceptual schemas); (Paas & Sweller, 2012). Many studies have been done in the field trying to figure out how to best manage these cognitive loads to enhance learning in different settings with different tools. Usually they are centered on ways of reducing extraneous cognitive load so that there will be available load capacity for other types of processing; however, more recently there have been studies about selecting tasks with the appropriate level of intrinsic cognitive load or ways of increasing germane processing.

Video Instructional Design. Instructional design guided by previous research on managing cognitive loads to enhance learning could be a methodologically powerful way to focus on knowledge acquisition learning outcomes in Participatory Video projects. While this methodology is not commonly employed by researchers in the field of educational videos for adults in developing countries, it is a very common feature in the field of learning from video. The literature body associated with the cognitive loads of video learning can be found in the Cognitive Load literature, the Cognitive Theory of Multimedia Learning (CTML), and more generally in Cognitive Science. There is a good deal of overlap in the literature, as all three of these fields examine issues of learning based on cognitive constraints, but they have different foci of analysis.

The most specific of the three is the CTML, which examines the cognitive loads associated with learning from multimedia sources such as powerpoints, animations, and video (Mayer, 2009). This research is almost entirely conducted in psychological laboratory research settings, using university students as participants (Henrich, Heine, & Norenzayan, 2010). The Cognitive Load literature is broader, and incorporates complex aspects of cognitive load associated with multiple concurrent loads. However, it is also primarily laboratory-based, and, historically, the field has not incorporated aspects of ecocultural context into analysis (Choi, van Merriënboer, & Paas, 2014). Cognitive Science is a broad and general field of inquiry; it encompasses the other two fields, in addition to research not associated with memory. There is Cognitive Science that examines the role of ecocultural context in learning. For example, there is cross-cultural research into differences in attention in learning (Masuda & Nisbett, 2001); however, very little of this research has incorporated the medium of video.

The overlaps in these fields allow for research from one to guide inquiry in another. Research in CTML and Cognitive Load literature is regularly intermixed. This can create hidden issues that arise when one theoretical perspective has partial overlap with another. The overlap can create contradicting predictions of the cognitive loads associated with the learning being studied. The following section discusses the instructional guidelines derived from Cognitive Science research. The areas in which all the predictions are the same will be discussed first. This is followed by discussions of those areas in which the overlapping methodologies create alternative predictions of cognitive load.

Instructional Design Guidelines

The following literature reviews aspects of cognition that might affect learning from video. As the studies conducted were not, for the most part, using video media, the studies will be summarized primarily on the basis of what was learned from the study, and without providing details about the experiments themselves. These guidelines come from multiple sources; in cases where guidelines from two different sources recommend different actions, the differences are highlighted and described.

Modality Effect. In the CTML, one of the biggest learning benefits of video education is the multi-modal presentation. Working memory processes information from multiple senses concurrently, and visual and auditory information are incorporated together as the sources are sensed. Studies in cognitive load show that because these two modalities are simultaneously processed, the overall cognitive load of the task is lower than it would be if all the information were received via the same modality. This is known as the modality effect (Tabbers, Martens, & van Merrienboer, 2001). The modality effect can make it less work to learn about a subject from video than from pure text. In a video, participants can see and hear the skill being learned. It reduces the cognitive load inherent in the learning media.

Transient Information Effect. The modality effect is mediated in amplitude and direction by the transient information effect (Leahy & Sweller, 2011). Information processing happens on a moment-to-moment basis, and understanding is dependent on the presented multi-modal information being integrated together. Auditory and visual information are different in their display, in that auditory information is more transient than visual information, which can be refreshed more easily. The load associated with incorporating information together is greater when the information is transient in nature and must be held in the working memory after it has passed. Thus, if information is more complex and complicated, the cognitive load of the information incorporation could be too much. This can also lead to a preference being placed on the less transient visual information over the more transient auditory information. As this affects learning from video, to reduce the load associated with the learning, the information being presented to each stream in the video needs to be balanced.

Contiguity Effect. Another aspect of the cognitive load associated with video learning is the order of information presentation in the video. The contiguity effect hypothesizes that simultaneous presentation of information in two modalities improves learning over serial presentation of the same information. This effect was shown in an experimental study that examined the audio modality with verbal descriptions of processes and the visual modality with drawn animations of the same processes (Mayer & Sims, 1994). These representations would be presented either serially, with verbal description of the process at one time and visual representation of the process at another, or contiguously, with both verbal and visual information presented at the same time. Both knowledge learning and transfer were examined in relation to the learning experience. The findings of the study supported the hypothesis that simultaneous presentation improved learning (Mayer & Sims, 1994). Elements that need to be processed together should be displayed together in space and time. If they are separated, the process of combining them adds an extra cognitive load (Kalyuga, 2007). In creating educational videos, having the action being presented simultaneously with a verbal explanation of the action should improve learning over telling the person what is going to happen and then showing it happen.

Attention Constraints. The limited scope of working memory means that at times there is not sufficient available attention to actually learn the material presented (Logie, 2011). In the controlled attention model of working memory, working memory is seen as the executive control or controlled attention for the purpose of activating and maintaining memory representations, switching attention between tasks, inhibiting information, and suppressing unnecessary responses (Cowan, 2010). Important factors that determine how much attention is necessary are things such as the length of the video being presented and the complexity of the information in the presentation. Participatory Video research has shown a field-based preference for educational videos between 5 and 15 minutes long (Van Mele, 2011). By adjusting the presentation of the information, the cognitive load of the presentation can be reduced. However, the loads associated with these adjustments are interconnected and difficult to measure separately. For this reason, participatory feedback in a collaborative process is useful for determining the length of the learning segments and the complexity of the information presented (Dillenbourg & Bétrancourt, 2006).

Coherence Principle. The issue of what information to include in a multimedia presentation is addressed by the coherence principle. Essentially, this principle states that people learn better when extraneous information is excluded from a presentation (Mayer, 2009). It supports the concept that cognition is more difficult when extra information is presented. The extra information is interpreted as extraneous and more likely to overload the working memory, causing less learning to occur. One solution to this problem is a technique called "weeding"—the process of making the multimedia presentation as concise and coherent as possible, to reduce the amount of incidental processing that is required of the learner (Mayer & Moreno, 2002).

The coherence principle shares many of its elements with the seductive details effect, and the terms are often used interchangeably (Rey, 2012). It could be argued that if there were a difference between these two areas of research, that difference would be related to the level of interest of the extraneous information. When information is included that has been deemed to be irrelevant for the main purpose of the learning and only tangentially relevant to the subject, but is also seen as very interesting, this information is known as "seductive details" (Harp & Mayer, 1998). While the coherence principle and the seductive detail effect might be discussing the same phenomenon, it is also possible that the seductive details are a subset of possible information loads that could detract from the coherence of information presentation. The broader category of the coherence principle has been shown to influence learning with regard to extraneous sounds (Moreno & Mayer, 2000), textual additions (Rowland, Skinner, Davis-Richards, Saudargas, &Robinson, 2008), and other forms of multimedia additions (Shen, McCaughtry, Martin, & Dillion, 2006).

Signaling. When weeding is not an option because all of the information is necessary for comprehension, another way to make complex information available is through a process of signaling. The process of signaling uses cues to highlight essential material in the learning (Mayer, 2009). If information is very complex, signaling can simplify the process of selecting information and organizing key material. Signaling can come in many formats, such as written, verbal, or pictorial (Mayer, 2009; Mayer 2002). Evidence supports the claim that verbal signaling can be used to guide cognitive processing (Mayer, 2002); however, visual signaling has not been strongly supported in preliminary research (Mautone & Mayer, 2001). In addition to this, too much visual signaling seems to be detrimental rather than helpful. The signaling effect is also bounded by the complexity of the information—the information needs to be complex enough to need signaling so that the signaling is not extraneous information.

Congruence Principle. The multitude of studies supporting the previously mentioned guidelines makes their incorporation simple. The congruence principle is much less researched than any of the previously mentioned principles. The congruence principle developed out of studying the use of animations to facilitate learning (Tversky, Morrisony, & Bétrancourt, 2002). When studying animated scenes, it was found that when the animation looked more like the intended understanding, this eased the process of learning: i.e., the structure and the content of the visual image should resemble the desired internal representation. While the congruence principle has been mentioned in various studies, it has not been tested much with multiple modalities (Arguel & Jamet, 2009). This indicates the possibility of a theoretical overlap between the congruence principle and other aspects of cognitive load associated with the ecocultural context (Choi, van Merriënboer, & Paas, 2014).

Gesturing. Early CLT research looked at a dual-coding of information into both auditory and visual forms. While less researched, a convincing argument can be made for including a spatial information form as well. Knowing which way is up helps the brain spatially relate when perceiving a scene. Depicting a map that is oriented in the direction of the map user is an example of a technique used to offload the cognitive load of holding the spatial representation of the map in the user's mind and manipulating it to match the orientation of the mental representation (Wilson, 2002). These spatial issues can conceptually be connected to the difference between external and internal visual-spatial relations.

Movement and gesture have been shown to shape learning, as in evidenced in a study examining gesturing's effects on cognitive load in relation to present and absent objects (Ping & Goldin-Meadow, 2010). Previous research had shown that gesturing could be used with present objects to off-load memory constraints, but this study revealed further benefits to gesturing besides just off-loading memory to actual objects. To study this, they had children remember random words while performing an explanation task. Twenty-five children, 7-8 years in age, were divided into two groups and asked to perform 20 trials of a conservation of matter explanation—10 with gesturing and 10 without. The results of this experiment showed that gesturing was beneficial to children, whether or not the objects they were gesturing about were present or absent.

Other research has also shown gesture- and motion-based cognitive load (Jamalian, Giardino, & Tversky, 2013). For example, when collaborating together, gesture can reduce the cognitive load by off-loading memory work into a shared spatial organization (Dillenbourg & Bétrancourt, 2006). There is also research into spatial relations and how mental representations shape cognitive functioning (Freksa, Klippel, & Winter, 2007). The field of embodied cognition examines the role of this type of cognitive load, though usually not through a cognitive load framework (Wilson, 2002). More research needs to be conducted examining the load of movement and proprioception; however, the current research reinforces the cognitive importance of body motion in learning. The modeling of skill learning in video provides the benefit of using of gesturing and movement to reduce the cognitive load of the video learning.

Redefining Load

These studies highlight the cognitive load associated with a variety of aspects of the learning process. Traditionally, CLT research has examined the load associated with task, participants, and the interactions between task and participants. Research in this field has provided a great deal of understanding into ways to improve learning media creation, including the previously mentioned effects. Recent research has argued in favor of including physical environment as a third aspect of cognitive load (Choi, van Merriënboer, & Paas, 2014).

There are many benefits of incorporating environment into the cognitive load theory. It allows embodied cognition to be examined within the cognitive load framework. It also provides a framework for studying the off-loading of information into the environment and into social networks (such as collaborative learning). Additionally, it allows cultural differences in learning to be placed into a framework within which they may be examined. Finally, it allows context-specific learning differences (such as the effects of noise on processing or the difference in place-based memory) to be related to the cognitive load theory. These expansions to the CLT are likely to help determine which of these loads are actually separate processes and which are the same load being interpreted in different sensory modalities or environmental conditions.

Collaborative Load. Collaborative load is the term for the load associated with the work of constructing a shared understanding. In order for participants to collaborate, there must be some level of shared understanding. The amount of shared understanding necessary varies with the task. There is a cost to producing the right information to model a concept and a cost to repairing a misunderstanding should it arise; these costs must be balanced to optimize cognitive load (Dillenbourg & Bétrancourt, 2006). Misunderstandings lead to contradictions that need to be resolved, which can be a good thing for learning, but only if the ability to address the misunderstanding is there. In video, it is difficult to address misunderstandings after the video is created. For this reason, it is important to build a shared understanding during the creation process.

The Participatory Video process can be framed as a collaborative load endeavor. In this practice, participants contribute their perspectives during the video creation process in the expectation that the video created will be better suited for the audience (Lie & Mandler, 2009). This allows for a reduction of cognitive load by improving the video's cultural relevance and building a strong, shared understanding. The farther apart the perspective inherent in the learning material is from the perspective of the learner, the more work it takes the learner to bridge the gap between those perspectives (Jegede & Aikenhead, 1999). Like the congruence principle there seems be theoretical overlaps between collaborative load and ecocultural contextualization.

Expertise Reversal Effect. The expertise reversal effect is a complex cognitive load interaction moderated by the learner's prior knowledge about the subject matter being learned. This effect was observed in experimental studies in which the cognitive load predictions associated with the subject matter were supported by the data collected from subject novices but refuted by data from experts in the same subject matter. The presentation of extra guiding information improved learning for novices, but reduced learning for experts. This difference in load predictions based on the role of prior knowledge has become known as the expertise reversal effect. It is driven by the ways that an individual's pre-knowledge interacts with the new knowledge presented for learning (Kalyuga, Ayres, Chandler & Sweller, 2003).

Existing conceptual structures, known as schemas, interact with new information in working memory as a part of the learning process. In a well-developed conceptual schema, abstract conceptual elements are chunked and woven together. The chunking process allows the schema to take up less room in working memory, so the cognitive load of manipulating that information is reduced. An expert is simply an individual who possesses a well-developed cognitive schema in a particular domain.

There are two things that can happen when learning new information: the new information can either interact with (and, possibly, be incorporated into) a previously-derived chunked schema, or it can be used to build a new schema. Building a new schema requires a higher cognitive load than adding information to a previously-derived schema. If an individual is a novice, guidance can reduce the cognitive load of creating a new schema and can improve learning; however, if an individual already has a well-developed schema, guidance can provide redundant information that must be ignored or incorporated. This process can increase the cognitive load and reduce learning. This effect has been seen in many domains of learning, such as text processing and worked examples, and in relation to modality effects, effects of interacting elements, and imagination abilities (Kalyuga, Ayres, Chandler & Sweller, 2003). This has been shown to be the case with respect to both sensorimotor skills and complex cognitive tasks (Kalyuga, Rikers, & Paas, 2012).

Ecocultural Context. There are aspects of a task/participant/environment interaction that deal with the cultural environment's role in shaping learning. Very little of this research has been conducted in relation to cognitive load, and there remain promising areas to research in this area. When a video aligns well with the ways in which the audience thinks, it makes learning easier for the audience (Herrington & Oliver, 2000). To begin with, a video can be placed in a setting with which the audience is familiar. Doing that would improve learning from the video by making it easier for the audience to relate to the video context (Johnson & Aragon, 2003).

Another way to make a video more accessible to an audience is to present the video in the audience's native language. This improves learning by reducing the work necessary to comprehend the learning material (Bello-Bravo & Baoua, 2012). These video creation choices help audiences because they reduce the amount of work it takes to understand the video by placing the video in the same ecological and cultural context as the audience. The ecocultural context of learning materials frames the learning for the audience. This literature also exhibits a good deal of theoretical overlap with the previously mentioned congruence principle and the collaborative load research.

Applied Cognitive Science. Historically, there has been a gap between knowledge gained from Cognitive Science experimentation and application of those principles. This is true in most branches of education, not solely video learning. It is important to take Cognitive Science into account when creating learning media because whether they are examined or not, the principles mentioned in this section will effect learning. This is particularly salient when working in international contexts because of the variety of learners. By accounting for them in learning media creation the cognitive loads associated with the different learning tasks can be balanced. This reduces the possibility of cognitive overload and allows for the creation of more accessible instructional design.

Conflicting Guidelines For Education Videos

The instructional design of the videos used in the present research incorporated elements from multiple research-based frameworks: Participatory Video, CTML and other aspects of Cognitive Science. All of these frameworks have been seen as very successful for guiding learning in instructional material. Participatory Video is a framework already embedded in the ecocultural context of the learner. The guidelines derived from this framework focused on issues of sharing an insider's perspective and reducing uncertainty (Van Mele, 2006). As these studies were conducted in a setting similar to my research setting, issues of shared understanding seem important and useful to guide video creation.

The drawback of this framework is that learning was measured in such diverse and general ways as to be hard to objectively compare.

Cognitive science is a tool that has been seen to improve instructional design across a number of multimedia formats, including video. The field of cognitive load generally, and the cognitive theory of multimedia learning specifically, had a great deal to add to guiding video creation. The difficulties arise in the application of the experimentally-derived principles in a very different ecocultural context. Historically, Cognitive Science developed around a computer model of human thinking; parts and components were seen as the same in all people (Atran & Medin, 2008). This framework did not include ecocultural context initially, and so this area was initially neglected in the research. In the past few decades, the field of Cognitive Science has been conducting research to address this conceptual deficit. They have found that not all educational aspects of a learning medium will affect different groups in the same way, because people in different cultural contexts do not necessarily think in the same way (Buchtel & Norenzayan, 2008). This added a new dimension to the cognitive costs associated with learning, which is in the process of slowly being incorporated into new models of cognitive load. (Dillenbourg & Betrancourt, 2006 & Choi, van Merriënboer, & Paas, 2014). My research adds to this emerging field, using traditional Cognitive Science experimental methodologies in a field study using a population from a very different background than participants in traditional research (Henrich, Heine, & Norenzayan, 2010).

When ecocultural context is examined in relation to the coherence principle, issues arise. These two research-based guidelines provide opposite predictions of learning. The coherence principle recommends using the simplest description of the skill process possible to ease the process of information organization in learning (Mayer, 2005). In contrast, models of congruence, shared understanding, situated cognition, and ecocultural context recommend adding local, contextual information to the process description in order to situate the learning process and improve it. The experimental portion of my study compared the two recommendations against each other to better understand the aspects of cognitive load involved.

There is no doubt that the coherence principle shapes learning from video. This effect has been seen in multiple studies over decades (Rey, 2012). Theoretically, however, there might be another aspect of cognitive load associated with contextualization of information that also has an effect on the coherence principle. This was examined in my experimental study using coherence principle methodology in a rural Gambia ecocultural context.

While there have been multiple research fields that examine information contextualization (Tversky, Morrisony, & Betrancourt, 2002; Ping & Goldin-Meadow, 2010; Dillenbourg & Bétrancourt, 2006; & Choi, van Merriënboer, & Paas, 2014), the studies were conducted in a variety of methodologies and media formats. This makes the information difficult to integrate. Meanwhile, coherence principle literature is rich with research using multiple media formats with well-measured and well-documented measures through decades of stringent experimental work. For this reason the coherence principle/seductive details literature was made the basis for the experimental methodology.

Coherence Principle Methodology

The experiments in this section of the literature review are discussed in greater detail because the methodology of this research was used to inform the experimental methodology of my research. For example, the experimental study was a between-groups experiment, similar to most studies on the seductive details effect (Rey, 2012). After the pertinent research has been described, the methodology adopted from that research with be indicated.

Coherence Principle research. There have been many studies showing the operation of the coherence principle in video (Rey, 2012). One of the first of these examined a multimedia program explaining the formation of lightning (Mayer, Heiser, & Lonn, 2001). The control condition included a 140-second animation about lightning formation, with a concurrent narration broken into 16 segments. In the seductive details condition of the study, experimenters inserted six short narrated video clips into various positions in the presentation. The seductive detail presentation was longer than the other presentation by about one minute. The results showed a seductive details effect (albeit, an nonsignificant one) for video retention, and a significant difference in transfer. This video methodology guided my research in terms of differences in length of presentation and the placement of inserted material at the beginning or the end of a video segment.

Another study used as a methodological guide for my research was a video about procedural learning in physical education (Shen et al., 2006). The role of seductive details was examined in relation to an educational video about how to play net sports. This research used a mass-produced video about net sports, altered into two versions. In one version, the video was shortened to remove a fox analogy and fox fur visuals that were interesting but unimportant to learning about the net sports. The short video was roughly five minutes long and had approximately 840 spoken words. The other video included the fox analogy and was six minutes long, with approximately 1000 spoken words. Participants were 240 middle school students from a low-to lower-middle-class socioeconomic background in urban middle schools in the U.S. Midwest. The results showed a significant main effect of seductive details on both recall and transfer. The details did reduce learning from the videos.

The net sport video study on seductive details was the most similar to the present research in several ways: 1) it involved a person learning a procedural skill, one form of process-based learning; 2) it used a recorded video to examine the coherence principle, the format of current interest; and 3) the sole difference in version construction was the presence of extra video material in one version of the video, resulting in one video being longer than the other.

Applying methodology. As previous coherence principle research had measured recall and transfer to examine learning outcomes, my research included similar measures. Participants saw one of two videos and were asked to reteach the information that they had learned and to answer two transfer questions. Analysis of video reteaching measured the number of key elements mentioned and how many transfer questions were successfully solved. In creating these measurements, consideration was given to conceptualizations of information structure, key elements, contextualization, and seductive details.

Key Elements. Simple linear descriptions of activities are a common way of teaching processes, such as how something works (Mayer & Moreno, 2002). In this study, a linear description of activities was used as the structure for the procedural learning: in order to teach composting in the video, the schematic key elements were taught with simple transitions between them. For the sake of measurement, mentioning the key element, regardless of the amount of context presented in the retelling, was measured as the presence of the key element.

Contextual Information. Both the definition of the coherence principle and the concept of weeding were used to determine the definition of contextual information for key elements. In the literature addressing the coherence principle, any information that is not either a key element of a process sequence or an element of transfer between key elements is considered to be extraneous information—anything that is not necessary to achieve the instructional objective (Mayer & Moreno, 2002; Mayer & Jackson, 2005). In these videos, the key elements were simple activities, such as adding ingredients, mixing them, or covering them. The items necessary for composting to occur, and the technique used in the process, were the schemata of the key elements. In terms of the coherence principle, other information that would be labeled extraneous included: information about alternative uses of an item, information about physical details about the items, information discussing similar processes, and information about where or how to obtain items for the process.

With this understanding of extraneous, the manipulated difference between the direct and the contextualized videos were the inclusion of contextual information that provided the reasoning behind a task or variations on ingredients and tools for the process. The creation of the contextualizations as seductive details based the manipulation on the literature of seductive details and allows for a theoretical basis for analysis.

Measuring learning. In this study, learning was measured through reteaching and two transfer questions. This way of measuring learning was consistent with the methods employed in the seductive details studies. In general, coherence principle studies have some sort of retention or recall test and some measurement of transfer (Rey, 2012). The recall task in this experiment is based on a recall task used in a study by Mayer and Moreno (2002). Their study's presentation included an animated explanation of how lightning works with an auditory explanation. To test for recognition, they asked participants to "Please write down an explanation of how lightning works" (Moreno & Mayer, 2000, p 119). To mimic that, the measure of recognition used in this research was reteaching the video information to a hypothetical neighbor. This was a similar process to the task from Moreno and Mayer, with the difference being that the information was retaught to a video camera instead of written down. In addition to the video reteaching, two transfer questions were asked of the participant: one redesign question and one trouble-shooting question.

Transfer questions. One of the primary ways in which the seductive details effect studies measure meaningful learning is through the use of problem-solving transfer tests (Mayer, 2003). These tasks measure learning by having the learner present the learned information in a different form. This can be done with questions that make the learner explain part of the process (How are the lye and oil mixed to make soap?), redesign the process (suppose you want to make stronger soap, how could you do that?), and trouble-shoot the process (your soap is too soft; what could have caused this?).

Methodological Overview

The previous section addressed how Cognitive Science methodology could be rigorously applied and used in field-based experimentation. Methodological choices were explained in detail because if the analysis in this study proves to be meaningful, this methodology might be applied to examine learning from other skill-based educational videos. This could create data that could improve both Participatory Video learning outcome assessment and Cognitive Science field-based experimentation.

Examining Attitudes of Video Use in Gambia

As mentioned previously, Participatory Video projects primarily focus on the sociocultural benefits of video education as learning outcomes. The funds of knowledge accessible through video viewing and the potential for community change are very meaningful applications of video education in international development. For this reason, this information is regularly assessed for in Participatory Video projects. Currently, knowledge acquisition from video is viewed as less necessary than the sociocultural benefits associated with video education: the quality of the instruction in the video media comes secondary to the sociocultural roles it fulfills. This is evidenced by research in which measures of knowledge acquisition are less collected and less refined.

While a measure of learning from video media could be useful in assessing knowledge accessibility in that format, in the development field the utility of such a measure is seen as less important than the sociocultural benefits of the video learning. That is why the learning outcomes that were being measured were chosen—and why any methodology incorporated to aid in the measure of learning should also be evaluated by the intended audience for its effects on their perceived funds of knowledge.

My research included Participatory Video methodology in many aspects of the video creation process, but it incorporated guidelines from Cognitive Science to determine instructional design. To insure that the media created had sociocultural benefits similar to those seen in other forms of Participatory Video creation, my research used qualitative interviews to collect attitude information from the study's participants about the video format generally. This information was coded for categories such as access, empowerment, and visual processing. The literature from previous video review projects provided possible categories of sociocultural interest. Open-ended interview questions on opinions and values related to video use were recorded for each study participant. This type of open-ended questioning is common in the literature about video learning in the developing world (Paul Van Mele, 2011; Bello-Bravo & Baoua, 2012; Harvey & Sturges, 2010). Including this information completes the Participatory Video methodology and allows for the media from this research to be compared to other participatory processes.

METHODOLOGY

Educational videos were created in a Participatory Video project and adapted to increase conceptual understanding through attention to Cognitive Science guidelines. Using the media created in the participatory project, an experiment was run to examine the effect of extra auditory contextual information on skill-based learning. These issues were examined through one-on-one videoed interviews with rural Gambian villagers. Each participant saw one version of an educational video: either a direct version, with a simple linear story, or a contextualized version with extra auditory information. After viewing the video, the participants were asked to reteach the information that they had just learned. They also answered two transfer questions related to the video. This was followed by questions about video use and attitudes. Reteachings of the information presented in the videos were examined for the presence of the key elements necessary for understanding the skill. Transfer questions were analyzed for responses that accurately represented transfer of understanding.

The resulting interviews were examined in relation to these research questions:

1. Does the information contextualization used in the reasoning of the video affect the video learning outcomes associated with the video?
    a. Does the presence of contextual information in the video affect the recall of key elements from the video?
    b. Does the presence of contextual information in the video affect learning in relation to seductive details?
    c. Does the presence of contextual information in the video affect performance on transfer questions?

2. What are participants' attitudes and valuations related to video education? The interview covered aspects of perceived information access, sharing networks, valuations of video education, and video subject presence.

Research Setting

The Gambia is a small country in West Africa, bordered by the Atlantic Ocean on the West and surrounded by Senegal on all other sides. It is a former British colony composed of multiple tribes with different histories and languages. The national language is English, and this is the language used in schools. While there are a number of tribes, three primary tribal languages are used in The Gambia: Wolof, Mandinka, and Fula. The Gambian local languages are oral, not written; reading and writing are primarily learned in formal school education, where the language learned is either English or Arabic. In 2012, The Gambia had an adult literacy rate of 51.1%, with the majority of the literate population living in the urban, rather than the rural, regions (UNICEF, 2012).

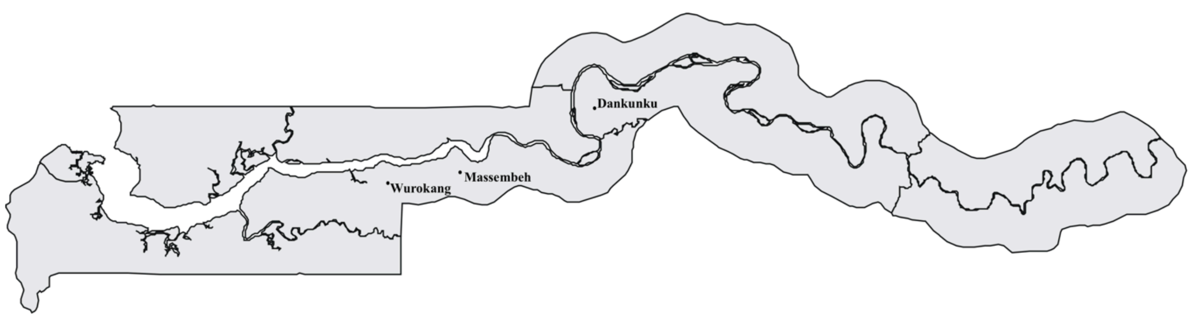

Figure 3.1. Map of The Gambia with study villages indicated.

Researcher's Role

At its core, this research examined the role of context in video learning in three areas: the contextualized process of video creation, the import of contextualization of information for learning from video, and understanding the social context of video learning in Gambia. This dissertation is also a form of educational media and as a researcher I want to contextualize my research.

From 2000-2002, I was an agroforestry volunteer in the Peace Corps. I was stationed in the village of Dankunku, The Gambia. I taught organic farming techniques to women, silviculture to farmers, and environmentalism to children. That previous time in the Gambia gave me expertise I used in this study. To be successful in my service, I needed to be fluent in the Mandinka language and to have cultural competence--the cost to Gambians of interacting with me had to be less than the value of my knowledge. Additionally, because of my experience working in the environmental field in the rural areas of The Gambia, I was aware of a number of the international development skills appropriate for video education in the region, which allowed me to more accurately assess the effort associated with learning these skills, from both novice and expert perspectives, more easily. It allowed me to play both the role of the researcher and the role of a knowledge expert.

This study was conducted in conjunction with a nonprofit project, Video Griot, and that shaped the outcome of both processes. The goal of the nonprofit project was to create a set of skill learning videos that could be distributed in rural areas to allow individuals with low literacy access to information that they would not have otherwise**.** Collaborators worked to design skill-learning videos on a variety of subjects, such as agriculture, health, and small business projects. The project's videography was conducted concurrently with the academic study. The video used in the academic study will eventually become one of the 20 videos comprising the video set that is being produced, as will a number of other video topics initially suggested in the Participatory Video process. The Cognitive Science techniques discussed here were also used, to varying degrees, in the entire Video Griot project.

Experimental Participants

The videos were tested in three rural villages. From these three villages, 92 women were recruited to participate in the study (Dankunku, *n*=31; Massembeh, *n*=31; and Wurokang, *n*=30). All participants were adult (aged between 18-80), spoke the Mandinka language, and had little English school experience. Most were married women with children.

Participant Recruitment. The primary investigator and the research assistant traveled to three Mandinka-speaking Gambian villages in rural Gambia. Upon entry into the village, the research team greeted the village chief with a gift of kola nuts and asked permission to conduct the study in the village. Once that permission had been received, the team would go to the compound of the village women's group leader with more kola nuts. The team described the study and requested the group leader's help in recruiting participants. The group leaders identified participants in the village who fit the study criteria and invited them to participate, each village did this in a slightly different manner. Approximately thirty participants were recruited from each village. Although the initial request for participants was open to both men and women, the men in the first village approached (Dankunku) were not interested, and we were able to recruit only two men. Men were excluded from recruitment in subsequent villages.

Design

This field-based study had a between-subjects experimental design, with criteria-based sampling. Each participant saw one of two videos: a video constructed with a direct informational presentation, with only cause-and effect reasoning present, or a video constructed with contextual details added. The version seen by each participant was randomly assigned. Of the 92 participants, 45 saw the direct video, and 47 saw the contextualized video.

Materials and Measures

The videos that were created for use in the experimental study were made as part of a Participatory Video process. It began with choosing a video topic. This topic was chosen by a collaborative group of skill-learning development work experts. The collaborators determined the information to be presented, determined the information format, and collaborated with the primary investigator in the creation of the presentation. The videos were situated in The Gambia and focused on teaching skills that could be useful to the life of a rural Gambian.

The subject of composting was selected for the video research project. The videos presented simple cause and effect chains of two participants, a man and a woman, performing the steps of making compost. The experts would prepare for the step, wait until the camera was set up and focused, and perform the task on camera. Each step was filmed separately. Pieces of film were edited together to show the steps of making compost in a linear, visual story. The video modeling of the steps were edited together with simple fades between video clips. The audio from the initial recording was detached and discarded. Experts collaboratively wrote a script that described the process of making compost and provided audio information that described the visual modeling. The same base script was used for both the direct and the contextualized versions of the video. There were 9 areas in which additional contextual information was added to produce the contextual version of the script. The extra contextual information provided either variations on form or explanations of process.

The script was first written in English, agreed upon by the team, and then translated into Mandinka. The initial script was reviewed and corrected by two other readers. The Mandinka language script was recorded, cleaned, and attached to the video. In sections where additional auditory information had been added, the related video clip was played for longer. Video clips were selected that showed the task for a period of time that was long enough to accommodate both versions of the script. These videos were rendered and formalized, and were the versions taken to the villages to be tested with rural Gambians. The complete script of the direct film with the key elements highlighted can be found in Appendix A.

Differences. The added contextual information was inserted at the end of a segment about a key element. This enabled the creation of one video, having all of contextual information present, and another video, composed of the original script before that information was added, from the same recorded segments. Figure 3.2, below, shows one section of the direct script next to the contextualization added and a screenshot of the video that was presented. This assured that the rest of the context and presentation were the same, with one video being a shortened version of the other. The direct version was 6 min 35 sec (571 words) compared to the contextualized version, which was 8 min 13 sec (908 words). While displaying videos of different lengths was not ideal, it reflected the norm within the seductive details literature (Shen et al., 2006; Harp & Maslich, 2005; Muller, Lee & Sharma, 2008). After the videos have been created and determined to be acceptable, they were overdubbed into Mandinka. Television shows are often overdubbed into other languages in the country, so this procedure was not expected to cause additional comprehension difficulty.

Direct Version: Plant material is added to the pile. In this video we are using sawdust. It is important that the plant material is in small enough pieces that water can get to the pieces of plant material and break it down fast.

Contextualized Version adds: There are many types of plant materials that can be used for this. Leaves can be used. Groundnut shells are also good. The husks of rice or coos can also be used. Maybe you could even use parts of garden things not used in cooking. You can cut the pieces smaller if you need.

Figure 3.2. Example contextualization and video screenshot.

Table 3.1

Contextualizations By Type

Contextualization	Type
Shade	Reasoning
Manure	Variation
Clean Soil	Reasoning
Plant Materials	Variation
Urea	Variation
Even Distribution	Reasoning
Water Balance	Reasoning
Pile Cover	Variation
Stick Temp	Reasoning

Key Elements. In preparing the video that would demonstrate the process of making compost, 14 key elements were identified as being necessary to recreate the compost. These elements were: Location, Manure, Soil, Plant Material, Vinegar, Sugar, Urea, Mixing the

Liquids, Water the Pile, Mix the Pile, Make the Pile a Damp Mound, Cover the Pile, Check the Pile with a Stick, and Uses of the Compost. The number of key elements mentioned by a participant during reteaching was used as a measure of learning.

Procedure

Recruited volunteers came to the compound where interviews were being held and waited for their turn to participate. In two of the villages, interviews were conducted in the familial compounds of the head of the women's group. In the third village, interviews were conducted in another village leader's compound. In all cases, the village determined the site that was appropriate and acceptable for the interviews. Interview sites included a room with seating for participants and interviewers in a relaxed setting.

The interview process lasted between fifteen minutes and a half an hour depending on the depth of responses given. It began with screening for participating criteria. The following were the criteria questions: Do you Speak Mandinka? (Must Answer Yes); Are you from the rural area? (Must be rural); Can you read a book? (Must answer no); and Some people prepare compost. Can you prepare compost? (Must be no). As the participants were recruited through the women's organization, almost all fit these criteria; volunteers who did not were thanked for their time and not included in the study. While initially volunteers with prior composting knowledge were not intended to be included in the study, during participant recruitment it became apparent that, for social reasons, this would not be possible. Instead, details about participants' composting history were recorded and used to provide an evaluation of their expertise.

Volunteers who did fit the criteria were invited to participate in the research process. They were recorded, using both video and audio, to aid in the interview translation process.

First, a consent waiver was read to perspective participants. On camera, participants were asked for their name and their verbal consent to participate in the study, after which demographic information was collected. The experimental procedure and materials were approved by the campus IRB.

Demographic information included, for all participants, their age, the village they were from, their school background, and, for most, their level of knowledge about composting. These were answered in an open-ended format. After the demographic information was obtained, the video camera was turned off, and the participant watched either the direct or the contextual video condition. The version seen by each participant was randomly determined before the interviews scheduled for that day.

After participants had viewed the video, the camera was turned back on and the participants were interviewed again. First, they were asked to think of teaching the material to a neighbor and to reteach the information in front of the camera. There was no time limit on the length of this reteaching. After the participants had completed their retelling of the process, they were asked two transfer questions: one that related a variation of the information in the video and the other about trouble-shooting a problem with the skill demonstrated by the video. The questions were asked one at a time, sequentially. Once a question had been answered, there was no returning to the question.

The interviews continued with the questions addressing participants' attitudes about video use. All of these questions were framed in an open-ended format except for the questions on preferred video topics, which were multiple-choice. If people were unsure how to answer, we prompted with an indication that any answer would be OK, because we wanted them to respond with whatever was most salient to them. Once all of the questions had been answered, the participants were asked if they had anything that they wanted to add or did not get a chance to discuss. They listened to a short debriefing, and were thanked for their participation. As they left, a fifty dalasi note was provided as compensation and was discretely handed over during the thank you handshake. The full original experimental script can be found in Appendix D.

Adjustment in Process

A pilot study of transfer questions was created. The first transfer question was included to measure learning transfer of process differences associated with different materials. The second transfer question was included to measure how well participants could adjust the whole process given different constraining conditions. The challenge was that the questions could not be more associated with one video than the other. The initial transfer questions were: “If you going to use rice stalks in the preparing of compost [instead of the plant material shown in the video] what would change,” and “If you have two wheelbarrows of plant materials [instead of four wheelbarrows, as mentioned in the ingredient list], how are you going to prepare the compost?”

This pilot study (n= 11), revealed flaws in both of these questions. The first question was culturally inappropriate. Gambians have particular historical cultural practices associated with the appropriate ways of composting rice stalks. This sociocultural knowledge made it difficult for villagers to reframe for the sake of the interview. This question contradicted their world knowledge. The second transfer question was unsuccessful because the ability to answer the question depended on a two-step transfer process. First, participants would need to identify that the amounts of compost ingredients actually shown in the video were different than the recipe initially given in the audio at the start of the video. Then they would need to translate the different amount of plant material to the recipe to determine that the recipe would need to be altered. This multistep process proved to be very confusing. After an initial pilot, both of these questions were changed. The first question related to a variation to task: “If you were going to use bara namoo while making compost, how would you need to do it?” (Bara namoo is a long thin field weed that is common in the Gambia). The second question required the participant troubleshoot an aspect of the task: “If you wanted to make the compost but you only had one half of a wheelbarrow of animal manure, how would you make this compost?”

At the same time as changes were being made to the transfer questions, the attitude questions were reviewed for participant understanding and appropriateness. Confusing and unnecessary questions were dropped and questions deemed useful were added. The final experimental script can be seen in Appendix E.

Analysis of Research Questions

All interviews conducted were translated and transcribed from their original Mandinka by the research assistant. The analysis process was conducted using NVIVO 11.2.1 to organize and manage data. The quantitative analysis of this study involved the key elements mentioned in reteaching and the answers given to the information transfer questions. The data from the initial study was included with the rest of the study data when questions were the same; this increased the study sample size and power. At times this means that for different questions the number of respondents varied based on the collection of specific information. This was seen as preferable to the smaller numbers overall or the combination of similar but different questions.

The primary investigator, who traveled to The Gambia to conduct the study, primarily analyzed this data. To assess the reproducibility of the research, a measure of inter-rater agreement was conducted. An outside researcher coded ten percent of the interviews (n=10) for key elements mentioned and for the correctness of transfer question responses. These interviews were randomly selected from the entire dataset by SPSS. For each interview, both raters marked key elements as either present or absent, and the transfer questions as either correct or incorrect. All of these were dichotomous ratings. The ratings on the 14 key elements and two transfer questions provided a total of 160 possible rating comparisons between the two raters. Out of these 160 comparisons, 15 were different and 145 were the same. This is a 90.63% agreement.

A major cause of the difficulty in inter-rater agreement was the interpretation of meaning from translated scripts. The primary investigator was much more familiar with Gambian phraseology than was the American research assistant. For this reason, in addition to the inter-rater agreement, a measure of reliability was calculated for the primary investigator. All 92 interviews were rated on two separate occasions. The mean for the first rating was 10.21, *sd*= 2.46, and the mean for the second was 10.24 elements, *sd* = 2.48. This left a mean difference between the scores of the two elements mentioned of .03. *sd*= .02. This difference was small enough to be considered nonsignificant. This combined the inter-rater agreement as seen an acceptable measure of accuracy (LeBreton & Senter, 2007). A final measure conducted to increase coding transparency was that each key element mentioned was highlighted and classified in its grouping on a digital file in NVIVO. This information is available on request.

Qualitative Analysis. A random sample of interviews was read through completely to verify that the translations were accurate. These read-throughs provided initial themes for the organization of responses. For each participant, one transcript document pertained to the individual's response. Formal analysis began by coding responses for each participant to each question separately. The responses to each question were grouped together. In the initial read-through, general themes of responses were identified. These became the coding groups; however, if there was not a reasonable thematic category fit, a new thematic category was created. All interviews were read through and coded for in the same manner. After all interviews had been coded, themes were examined for coherence and overlap between participants (Mostyn, 1985).

CHAPTER 4

THE VIDEO-MAKING PROCESS

The purpose of this study was to determine best practice guidelines for video production based on instructional design techniques. Providing a project review makes the process explicit to other practitioners. The following sections review the participatory process and describe the educational adaptations made to the video, guided by educational research. First, the techniques used in both videos will be looked at in terms of different cognitive processes related to video learning. This will be followed by a short summary of the completed videos and a discussion of some of the unexpected difficulties encountered in the video-making process.

While only two versions of a video about composting were used for the remainder of this study, the Participatory Video project itself encompasses the creation of twenty videos on different topics for a non-profit project, Video Griot. The guidelines that guided the creation of the video for this research were also used for the creation of the other learning media.

Participatory Design

This study was a cross-cultural collaboration in which the video-making process combined Gambian expertise with guidelines based on educational research. All Gambian collaborative participants were volunteers. They were recruited through prior connections and social interactions, and from local NGOs. Participants varied in education level, time availability, location accessibility, and skill experience. Work was divided based on a combination of these characteristics, taking into consideration the task that needed to be done and the people who had the desire to do it. The project also involved training volunteers in the technical aspects of video creation. The making of the video used in this study involved three primary Gambia contributors and a number of other secondary contributors. The next section describes the three primary Gambian contributors: Mr. Bah, Masanneh, and Isatou.

Mr. Bah. Momodou Bah was the collaborator for both the video study and the video non-profit. He worked for the Peace Corps as an assistant agriculture specialist when I was first a volunteer (2000-2002). When I returned in 2015, he was the Assistant Director of Agriculture for The Gambia. He is a Gambian of Guinean Pulaar ancestry. He initially joined the Peace Corps as a language and culture instructor for volunteers. That experience was very helpful for both the study and the project. Mr. Bah was very good at translating scripts from English into both Fula and Mandinka. Moreover, as an agriculture specialist, he knew many of the skills we were trying to transfer and the specific vocabulary relating to those topics of interest. Mr. Bah's interest in video education made both the study and the non-profit project possible.

Masanneh Jallow. Masanneh Jallow was my primary research assistant. He was in his early 20s, and had graduated from grade 12. He helped me on this project as an apprentice, both to learn skills that might help him in his future and to show me appreciation for my help in assisting him to continue his education. While I was the videographer for the video used in my study, Masanneh was the videographer for many of the videos in the project. He became skilled at video recording, video editing, voicing-over, and translating. In the video for the study, he provided the Mandinka language voiceover of the two scripts.

Moreover, he conducted the interviews with villagers and translated and transcribed the interviews.

Isatou Bojang. Mr. Bah introduced me to Isatou. She was a woman in her early twenties who was employed by the Peace Corps to help maintain the Peace Corps training site in the village of Massembeh, where her family lived. She graduated from grade 12, and Mr. Bah had been training her in advanced horticulture techniques. She was the female who modeled the process of making compost with Mr. Bah in my research videos.

Topic Selection

The video-making process began by choosing a video topic. First, a collaborative group of development work experts came up with a list of possible topics for skill-learning videos. This list included video topics for both the Video Griot project and the study. For the study, the goal was to find a video topic that was not well known in the villages, but that would be culturally appropriate for both males and females to perform. Additionally, for practical reasons, the video topic needed to work with the local environment at the time of video filming. The list of initial possible video topics can be found in Table 4.1. These suggestions were used for both the academic research and the non-profit project.

Table 4.1

Development Workers' Video Suggestion List

Powdered soap	Seed saving techniques	Mango jam
Tie and dye	Basic gardening	Stove building
Bee-keeping	Soil amendments	Composting
Processing wax and honey	"Plumping nuts"	Palm oil processing
Poultry houses	Cashew fruit processing	Cloth weaving
Neem body lotion	Cashew seed processing	Batik making
Organic pesticides	Pepper sauce	Purse making
Body soap	Tomato paste	Wood lots
Body lotion	Incense processing	Fruit tree planting
Lip balm	Edible bush plants	Live fencing

The subject of composting was selected for the video research. This subject was seen as useful for both genders: Gambian men plant trees and women garden, and both tasks are improved with compost. Moreover, making compost is cheaper than buying western fertilizer for peanut or millet fields. The skill has the potential to save practitioners money, or even to make them money—if they compost on a large scale. It could improve quality of life.

Traditionally, fields and garden beds are amended primarily with animal manure. This process does not amend the soil as successfully as composting, because minerals can be lost or inaccessible. The video would provide viewers with a skill that could improve crops more than traditional practices do. Finally, composting worked well with the filming requirements regarding time and location. Compost can be made throughout the year. For these reasons, composting was the selected topic for academic research.

The Filming

Composting can be done in a variety of ways, and with a range of tools and equipment. The composting recipe used in the educational video was the same recipe that Mr. Bah would be using later with the new Peace Corps Environmental volunteers. He had the ingredients gathered at the Peace Corps training headquarters in Massembeh. We travelled to the village to record the video. Mr. Bah purchased the necessary expendable ingredients--urea (an imported chemical fertilizer), vinegar, and sugar--before we headed to the Massembeh camp. These ingredients would be expected to be available in any urban area or at weekly markets in the rural areas.

Mr. Bah had provided me with a written set of instructions for the making of the compost. I filmed the process while Mr. Bah and Isatou acted out the making of the compost. They began by cleaning the location where the compost pile would be placed. The next step was the pounding of cow manure: The manure was placed in the cleaned area in the shade. Next, topsoil was collected and sifted to remove foreign materials. The sifted topsoil was added to the pile of cow manure. Then the plant material was measured in a wheelbarrow and added. These three dry ingredients were mixed together with a shovel. In a watering can, vinegar, sugar, and urea pellets were mixed with water. These were stirred until the ingredients were dissolved. Then the liquid was evenly distributed over the pile. The pile was mixed again, and more water was added. This cycle continued until the compost mix formed a damp mound. At this point the pile was pushed together and covered with a plastic tarp. The cover was held down with rocks. Mr. Bah then opened a week-old pile and tested it with a stick. He stuck it into the pile and checked to make sure the tip was warm; that was a sign that the compost was breaking down as it should. Finally some of the uses for compost were shown.

The majority of the film showed Mr. Bah and Isatou modeling the steps of making the compost. They prepared for the step, waited until the camera was set up and focused, and performed the task on camera. Shots were filmed from multiple perspectives, providing a selection of clip lengths, zoom levels, and camera angles to work with. We did not film appropriate scenes for the beginning and the ending of the video on that day. These scenes were filmed at different times and combined with filming from that evening. They included video of compost piles and compost being used, and a photo of polypots—the plastic bags suitable for filling with compost to plant trees.

Story Creation

These pieces of film were edited together to show the steps of making compost in a linear visual story that fit under the general description of a coherent argument with a simple cause and effect chain. This was done to match the coherence principle methodology. The video modeling of the steps were edited together with simple fades between video clips. The audio from the initial recording was detached and discarded. Mr. Bah and I collaboratively wrote a script that described the process of making compost. The audio information described the visual modeling. The base scripts for the two versions were the same; however, there were 9 points at which additional contextual information would be added to the contextual version of the script. The extra contextual information provided either variations on form or explanations of process.

The script was written in English first, agreed upon by the team, and then translated into Mandinka. Mr. Bah translated the script, after which his translation was reviewed and corrected by two other readers. Masanneh voiced the Mandinka language script and recorded the audio information. This audio was edited to remove background noise, and then was attached to the video. In sections where additional auditory information was added, the video clip was played for longer: the video clips that were selected for the video showed the task (either singly, or in combination) for a duration that accommodated both versions of the video. All versions included the same clips, though for differing amounts of time. These videos, after being rendered and formalized, were the versions taken to the village to be tested with rural villagers. Appendix D illustrates the breakdown of the videos. The appendix shows time stamps for each video transition, a description of what is being seen, and the script for both versions.

End Products

Both versions of the video begin with the Video Griot logo and theme music. This beginning section is 23 seconds long. At 18 seconds, the logo fades out and a title fades in. The direct video has a script of 571 words and a playtime of six minutes and thirty-five seconds; as compared to he contextualized version's script of 908 words and playtime of eight minutes and thirteen seconds. The title was the only written text in either version of the video. The script describes the process of what is happening onscreen, while showing all of the steps. Visual scenes are steady, as filming was done using a tripod. There are few changes in focus during scenes, and a preference is shown for visual scenes with environmental contexts. Auditory information is provided to guide in the understanding of the process being shown. The scope of the video, no matter the version, is limited to a simple cause-and-effect chain of key elements. The direct version of the video includes only that chain. The contextualized version included added contextual information. In the deciding how to make these films, and what to include in them, our choices were guided by educational research.

Adjustments Based On Educational Research

The video was being made to explore the role of auditory contextualization on skill-based video learning, but it was also being made to make information accessible to the specific audience: rural Gambian villagers. Cognitive science was used to guide the creation of both versions of the video. The next section of this chapter describes how aspects of Cognitive Science shaped the final videos. It includes aspects that shape both versions similarly, as well as those that are reflected in the differences between the two videos. The guidelines used can be seen in Table 4.2 below. The following guidelines will be discussed as they were applied in the video making process.

Table 4.2

Cognitive Science Guidelines and their Descriptions

Guideline	Description
Modality Effect	Present visual and auditory information together
Contiguity Effect	Multimodal information should be presented simultaneously instead of serially
Transient Information	Balance the loads associated with the transient nature of sensory information
Attention Constraints	The limits of attention influence desired video length and information complexity
Coherence Principle	A simple linear information presentation with no extraneous information improves learning
Congruence Principle	External representations of learning should mirror desired internal mental representation
Modeling	The method of acquiring the information is similar to previous learning methods
Contextualization	Use ecocultural contextual information to ease the process of creating a shared understanding
Signaling	Help the audience focus on relevant information by highlighting it in some way

Cognitive load

There is cognitive work associated with the learning from the specific format of video. Our video creation goal was to create videos that kept the cognitive load associated with the video viewing from reaching an overload threshold. The load needed to be kept within certain required constraints to be manageable for viewers; too much load would exceed a mental threshold and lead to cognitive fatigue, which in turn would reduce learning. One way to manage the cognitive load of learning media is by identifying areas of extra load and removing them. Removing irrelevant information makes it easier to engage with the relevant information. This reduces the chance of reaching the load threshold and the learning detriments that accompany it.

Modality Effect. Processing auditory and visual information together reduces cognitive load because of the types of information are processed simultaneously in different neural channels (Tabbers, Martens, & van Merrienboer, 2004). This is known as the modality effect. Simply by presenting both visual and auditory information, the video makes it easier to process the information that is presented. To take advantage of the modality effect, the video includes, for each scene in which a skill is being performed, an auditory explanation that supplements the visual information.

Contiguity Effect. The contiguity effect indicates that it is easier to learn information that is presented in multiple modalities concurrently instead of serially (Mayer & Sims, 1994)—e.g., that provides auditory explanation at the same time as the visual information it explains, rather than before or after. Thus, in the creation and editing of the video used for the study, corresponding auditory and visual information were presented simultaneously for better learning. At times this was difficult, because the movements of the expert modeling the skill were faster than they could be described in words. A number of techniques were used to work around this issue. One of the primary techniques was adjusting the length of visual repetition in the presentation of the skill process. For example, if a step in the process were the mixing of ingredients, a large stretch of the expert stirring would be included, to allow enough time for a complete auditory explanation. If a single video clip was not long enough, two clips were spliced together to provide the length necessary to accommodate the auditory explanation. This was done in the composting video when using a stick to test the composting process. The video clips were too short so two clips were attached together to provide visuals for the entire process narration. Another technique used if the video was not long enough, or if detail was needed, was to show the video in slow motion. Where we had no video clip that fit a necessary auditory explanation, a still picture was used in its place.

Transient Information Effect. The transient information effect deals with the cognitive load associated with the transient nature of information during information processing (Leahy & Sweller, 2011). Taking into account the transience of information allowed for a reduction of the extraneous perceptual load from the video. One technique used to reduce the extraneous load was the placement of the camera on a tripod during filming. This reduced shaking and controlled panning—both of which add to extraneous perceptual load during viewing (Logie, 2011). Perceptually, camera motion makes it harder to identify objects in the visual scene. Thus, shaking adds to the load of holding the visual image in place during the decoding process, making it more difficult for the viewer to quickly decode the visual scene and incorporate its informational aspects into their fluid, developing understanding of the process. In addition, a changing scene adds visual complexity to the learning process. The audience that these videos were intended for is not accustomed to learning from video. For this reason, whenever possible we kept the camera in one place for each section of learning. When we decided to combine two scenes for a learning section, such as to show a close-up, we extended both clips specifically to allow the participants more time to decode the scene. As a rule of thumb, we showed each still image for at least five seconds, and each video for at least 8 seconds--but preferably for fifteen seconds or more.

The transient information effect was a noticeable issue that needed to be accounted for in the videos' creation. Studies have made it apparent that when the information being presented is too complex, viewers tune out auditory information in favor of focusing on visual information (Leahy & Sweller, 2011). Visual information is refreshable in a manner that auditory information is not. As it takes longer to integrate auditory information and the information that is less refreshable than visual information, that information will be worked with less and forgotten more. In the composting video used in the study, for example, most participants remembered the amounts of ingredients that they perceived visually, rather than the amounts actually used in the recipe, which were presented auditorily. For example, viewers saw three bottles of vinegar in the visual pictures of the ingredients but heard that we only used one. Many participants said that the recipe called for three bottles of vinegar.

Attention Constraints. Holding the aspects of the video in the mind and integrating the information presented required attentional resources. Attention allows comprehension to occur. Participatory video experts found that in development work, the ideal video length was between 5 and 15 minutes (Van Mele, 2011). The information covered in that time needed to show each step of the process. This was necessary because if the video assumed that the audience would know how to do the step without seeing it, participants were less confident in their ability to perform the skill from the video and might be less willing to try the skill for themselves. Less than five minutes long and videos would not present enough information to adequately cover the necessary basics for most skills; more than 15 minutes long, on the other hand, and a video would be too complicated for a portion of the audience to comprehend. Skill-based learning videos within that range were perceived as being more accessible to audiences.

Coherence Principle. Comprehension is built on conceptual frameworks. The organization of information in the learners' minds shapes the cognitive load associated with information access by way of learning media. Intentionally simplifying the organization of information can simplify the learning process. When learning an entirely new conceptual framework, it is best to have information presented in as simple a cause and effect chain as possible. This was seen in the literature addressing the coherence principle (Mayer, 2001). A simple cause and effect chain of steps is seen as easier for this type of learning because it requires less integration of unnecessary additional information. When unnecessary information is present, it can distract the learner from the material that is integral to the process being modeled.

Congruence. The congruence principle holds that the external representation of a learning situation should mirror the internal desired internal representation to ease the process of learning (Tversky, Morrisony, & Bétrancourt, 2002). Among other things, this principle informed our choice to avoid intense zooming during the filming, so as to avoid adding to the load associated with decoding the image being presented. Zooming can be visually confusing to users less familiar with this media format—for example, when the perspective of the camera shows an image substantially different than an image the naked eye can obtain, it is harder for the viewer to create a mental representation of that image. Permagardening expert Peter Jensen related an anecdote illustrative to me in the field: A malaria education video confused many of its viewers by displaying a magnified image of a mosquito. Viewers had difficulty decoding what was in the visual scene, because they had never before seen a magnified mosquito. The difference between the visual representation seen and the internal mental representation people held added extraneous cognitive load. Therefore, the video clips we selected for inclusion in our video either had size representations that made sense to the audience or gave the audience additional time to allow for visual perception to map onto their mental representations of the object.

Modeling. The skills taught in these videos were taught through modeling. One of the reasons that these videos use modeling is that, if children in these communities do not go to school (and many of them do not), their traditional method of learning is modeling (Rogoff, 1990). When a girl is small, she will watch her mother cook. When she feels ready, she will join in the cooking process: she will try to cook after watching the behavior being modeled for an appropriate length of time. Watching a video that teaches a skill process through modeling is very similar to the traditional method of information collection. This makes the process easier, because the load associated with how the information is acquired has been practiced, and is therefore reduced. Less work is associated with interpreting information presented in a familiar modality.

Contextualization. One of the tools we used the most for this study was contextualization of information. This included using real-world media, experts from the field, and local contextualized tools for the process. This guideline was derived from both Participatory Video methodology and from Cognitive Science. In the cognitive load theory literature, the theories that relate closely to this principle are the congruence principle (Tversky, Morrisony, & Bétrancourt, 2002) and the shared understanding principle of collaborative load (Dillenbourg & Bétrancourt, 2006).

In the composting videos, real-world media was used to reduce the cognitive load of creating a shared understanding. The incorporation of real-world media was a powerful tool for a number of reasons. It allowed the audience to: 1) connect their current understanding to a similar visual field and contextual base; 2) select for information that was relevant to their personal understandings; and 3) co-create their own understanding in an egalitarian manner. Nonetheless, the cognitive load associated with processing of real-world media can be heavy. Clips that are overly long or unclear in focus can overload working memory and reduce learning. For this reason, real world-media use should be guided by information signaling.

Signaling. Signaling highlights important information in a learning media presentation to ease the learning (Mayer, 2009). Cognitive tools such as auditory information guidance, camera focus, and gesturing can support this goal. They do so by guiding the learners' attention to the important aspects of the skills being revealed, which removes the load associated with uncertainty of understanding. When the guiding auditory information is presented with real-world visual information, it allows the learner to collect visual information that will support their creation, internally, of an understanding.

The auditory information tells what is happening, and can correct for potential misunderstandings. As misunderstandings add cognitive work, addressing them can reduce the cognitive load of the processing. Potential misunderstandings were uncovered by interviewing experts during the Participatory Video process. They knew where people often make mistakes in the process; knowing of these allowed the video to focus participants' attention on the areas where mistakes are common, so that participants can develop an advanced knowledge of the difficulties.

Careful selection of which media to include reduces the load associated with understanding complex information. In the case of the video used for this study, the simplification process included removing all real-world audio and including only real-world video. Reducing the complexity of the audio—eliminating background noise and limiting the audio presentation to voiceovers--was seen as an easy way to reduce cognitive load at a low cost. Depending on the function of the learning media, there may be many different approaches to how to balance that load.

Summary of Guidelines

The modality effect, the transient information effect, and contiguity effect shape video creation for all learners because they are related directly to information processing. The cognitive load associated with these tasks relates to the load added in incorporating information and the load reduced by the functional aspects of modality differences. For this reason the videographer must be cognizant of the speed and the complexity of the information being processed in the videos. Gesturing and collaborative load reduction through the use of local settings, languages, modeling, and cultural relevant materials, can reduce the cognitive load of meaning interpretation. These Cognitive Science guidelines can be used in video creation to make a video that simplifies learning for the learner. It includes both visual and auditory information presented contiguously with gesturing and uses collaborative load reduction techniques. A short, 5-15 minute long, video was seen as ideal by both field practitioners and researchers for limiting the complexity of information (Van Mele, 2011).

In this research, the goal was to adapt video for skill learning by rural Gambian adults who have no formal schooling. This audience has little experience with learning from video. Without as much experience with screens, they need more time to process images and partial scenes. Additionally, formal schooling helps a person expand their working memory load (Ventura, Pattamadilok, Fernandes, Klein, Morais, & Kolinsky, 2008). An audience without formal schooling would have little experience off-loading processing into a less transient form to reduce cognitive load. To reduce the working memory loads associated with visual complexity, a number of videography techniques were used: the videos for the study were produced holding shots for longer, to make information less transient (at least 5 seconds); the camera was on a tripod to hold shots steady; the camera did not pan or change focus during shots, so as to reduce distraction; shots were made from farther away to include more background in the shots; voice-over was used to reduce the distraction of background noise, and each step in the process to be learned was shown, to reduce misunderstandings. All of the aspects of cognitive load discussed in this chapter were applied to creation of the video for the study, as they were evidenced to improve learning.

In using Cognitive Science to guide learning media creation, the goals are to balance cognitive loads and keep the overall load below a threshold. The multitude of variables that shape overall cognitive load allow for a good deal of flexibility in application. Which of the techniques to use should be determined by the context of the particular learning unit and the intended audience. There are ways to make scenes easier to perceive, information easier to integrate, and attention less taxed. By applying these techniques to the creation of media, the information presented by the media will be made more accessible to the audience without changing the content itself.

Difficulties

Any participatory process has its difficulties. By sharing the ones encountered in this video making process, my intent is to make other researchers aware of the possible issues and what to avoid. The two primary areas of concern were the understanding surrounding estimations of amounts and the difficulties associated with voicing over into a language with only an oral tradition, instead of into a codified, written language.

Estimating Amounts. In the making of the compost videos, there were time constraints on the filming. Due to logistical constraints, the filming of the composting video began at approximately 5 pm. This meant that, within 1.5 hours, it would be too dark to record. There was insufficient time to prepare a full batch of compost within the available time. Instead, the recipe was adjusted to produce only a third of quantity of compost that was originally intended. This reduction in the amounts of ingredients proved to be very confusing for participants. The ingredients were listed at the beginning of the video. The amount of each ingredient appropriate to a full recipe was presented in a verbal list, and then it was stated that, for purposes of the video presentation, the recipe was being dividing in three. Participants invariably remembered the amounts that they saw, not the amounts that were stated in the auditory presentation. If one wheelbarrow of a substance being added were shown, then the audience would remember one wheelbarrow as being the amount required in the recipe. This was observed in responses to transfer questions particularly.

Voicing Over. All videos were made with voicing over to simplify the audio and allow the information to be translated into multiple local languages. This process of voicing over was more difficult than initially anticipated. One aspect of difficulty was that local languages were not traditionally written languages. The lack of written language meant that there were not strong standardizations for spelling in local languages. Dictionaries exist, but they are neither comprehensive nor easily accessibly by the general population. While academically this reveals interesting areas to research, practically, this made it more difficult to create voice-overs. It was more difficult for volunteers to read the scripts presented in local languages, because the presentation in written form was unusual. Very few of our volunteers enjoyed (or were proficient at) the process of reading scripts in local languages.

In the end, the research assistant became responsible for voicing all of the local language scripts. This also presented issues when additional videos were being translated to languages other than Mandinka for the Video Griot. For example, in Pulaar, there were many regional dialects, which complicates translations. In the end, we found it most efficient for translators to use their own Pulaar dialects; as a result, three different dialects of Pulaar were used to voice-over the 20 scripts produced for the video project.

These difficulties are just a few examples of the many problem-solving and negotiation cycles involved in a skill-based educational video. Nevertheless, the process of coming together and sharing understandings to create an understandable and accessible learning tool was seen as a valuable endeavor by all of the contributors, and everyone was very pleased with the outcome of the videos actually created. The videos were viewed as accessible learning tools for adults in rural communities. Furthermore, it increased other outside collaboration between the development workers involved in the processes. This was seen as capacity building and community developing—not just for the users, but for the experts as well.

CHAPTER 5

QUANTITATIVE RESULTS

When Cognitive Science predictions were unclear because of the cross-cultural context, experimental methodology was used to explore the role of additional auditory information contextualization in learning. This was examined by creating two versions of a video on composting. The first was a direct auditory explanation of the composting process accompanied by a real world example of each step of the process performed by an expert to provide visual modeling of the skill in practice. The second was the same video with additional auditory contextual information in nine places. Guidelines based on the coherence principle would suggest that learning would be better when information was accessed from the direct version of the video, because that video would contain little information that might distract the learner from the specific skill being learned. Guidelines based on removing uncertainty in an ecocultural context suggest that the extra contextual information might reduce the load associated with the learning, and thus result in better retention of information relating to the skill being learned. This experiment tested these two guidelines against each other, to better understand the role of information contextualization in cognitive load.

This study compared learning from the two videos in relation to four areas of interest: 1) it compared the number of key elements mentioned in each version group; 2) it examined how prior composting knowledge affected key elements mentioned by version group; 3) it assessed for signs of seductive details impeding learning; and 4) it compared group responses to two open-ended transfer questions.

Key Elements

In the videos, 14 key elements were mentioned as part of the process of making compost. These key elements were aspects of the process of making compost that were seen as necessary to recreate the process and get successful results. To measure learning, participants were asked to, "Pretend that you are teaching your neighbor how to make compost. Teach it to me." A participant's learning was measured by counting the number of the key elements that were mentioned in the reteaching segment. The key elements can be seen below in Table 5.1. The table includes the number of participants who mentioned each key element and the percent of the time each of the key elements was mentioned. There were 92 Gambian women who participated in this part of the study.

Table 5.1

Summary of Mentioned Key Elements (N=92)

Video Elements	**# of Participants Mentioning Element**	**Percentage of Participants Mentioning Element**
1. Location	55	60%
2. Animal Manure	79	86%
3. Soil	70	76%
4. Plant Material	63	69%
5. Vinegar	70	88%
6. Sugar	81	88%
7. Urea	67	73%
8. Mix the Liquid Ingredients	61	66%
9. Water the Pile	82	89%
10. Mix the Pile	74	80%
11. Make the Pile a Damp Mound	60	65%
12. Cover the Pile	72	78%
13. Check the Pile with a Stick	53	58%
14. Uses of the Compost	55	60%
	M	***SD***
Number of Elements Mentioned	10.24	2.48

The range of key elements mentioned ranged from 4 to 14, with a mean of 10.24 elements, *sd* = 2.48. There was no difference in mean between villages: (Dankunku M= 10.23, *sd*= 2.57; Massembeh M= 10.06, *sd*= 2.52; Wurokan M= 10.43, *sd*=2.43). While a few participants performed rather poorly when tested for their ability to reteach information, the majority did quite well, as can be seen from the high percentage of the time each element was mentioned.

There was no statistical difference in the key elements mentioned when compared by the video version of the lesson seen. The direct version (n =45) had a mean score of 10.13, *sd*= 2.63. The contextual version (n=47) had a mean score of 10.34, *sd*=2.35. When an independent samples T-test was used to compare group means, there was no significant difference between the two groups $t(90)=.596$, $p = .442$.

Prior Gardening

This question looked at the effect of prior knowledge about composting on learning from the composting videos. Initially, this study was planned to include only novices in gardening. Prior knowledge was examined only as a qualifying characteristic. During recruitment, however, many potential participants had prior composting knowledge. Instead of being excluded, these participants were included and interviewed about their prior composting history. During data analysis, it became apparent that prior gardening knowledge might correlate with the learning process. Based on site notes and the transcribed record, prior gardening information was identified for 71 participants. This information was dichotomized into more or less prior knowledge. If a participant mentioned gardening, composting, or seeing others compost, these are identified as having more prior knowledge. If, however, the participant mentioned not knowing composting, not gardening, or having never seen anyone compost, the participant was marked as having little prior knowledge. Table 5.2 provides a breakdown of which video was seen by which participants in relation to prior gardening knowledge.

Table 5.2

Composting Knowledge of Participants

Composting Knowledge	Frequency
Direct	
Little Prior Composting Knowledge	16
More Prior Composting Knowledge	18
Contextualized	
Little Prior Composting Knowledge	21
More Prior Composting Knowledge	16
Total	71
Missing	21

While these sample sizes were small, they were seen as sufficient to derive an initial understanding of the subject. An exploratory 2 x 2 factorial analysis of variance was performed to assess the effect that adding contextualization has upon how well participants remember key material from the lesson. Participants' mentioned total of key elements were examined in relation to their prior knowledge about composting (low or high), the version of the video they viewed (direct or contextual), and the interaction between the two factors. Results from the analyses revealed an interaction effect between prior composting knowledge and the version of the video viewed, $F(1, 67) = 6.98$, $p = .010$, but no main effect for either video viewed, $F(1, 67) = .56$, $p = .456$, or prior knowledge, $F(1, 67) = 2.78$, $p = .10$. To examine the interrelation better, while constrained by the small sample size and the sample's violations of the assumption of homogeneity of variance, $F(3, 67) = .75$; p=.524, grouped t-tests with split samples were also conducted. When the dataset was split by video viewed, there was a difference in the average scores of experts and novices, $t(32)= 2.94$, p=.006, r= .45, in which novices mentioned significantly more key elements than did experts. There was no difference in performance based on prior knowledge in the contextualized video, $t(35)= 2.974$, $p= .49$. Similarly, when prior composting knowledge was used to split the sample, there was a difference in the mean scores of groups of experts by video version seen, $t(31.93)= -2.17$, $p=.038$, $r= .36$, in which experts who saw the contextualized video scored significantly higher on key elements mentioned than did experts who saw the direct video. There was no significant difference related to video version viewed in novices, $t(34.98)= 1.56$, $p=.127$. Means and standard deviations of all groups and t-test results can be found in Table 5.3. Table 5.4 displays the ANOVA results.

Table 5.3

t-tests Comparing Mentioned Key Elements by Version Seen and Composting Knowledge

Viewing Groups	***M***	***SD***	***T***	***p***
Direct				
Novice (*n*=16)	11.13	1.75	2.974	0.006
Expert (*n*=18)	8.78	2.69	(*df*=32)	
Contextualized				
Novice (*n*=21)	10.10	2.26	-0.705	0.486
Expert (*n*=16)	10.63	2.28	(*df*=35)	
Novice				
Direct (*n*=16)	11.13	1.75	1.565	0.127
Contextual (*n*=21)	10.10	2.26	(*df*=34.98)	
Expert				
Direct (*n*=18)	8.78	2.69	-2.168	0.038
Contextual (*n*=16)	10.63	2.28	(*df*=31.93)	

Table 5.4

2 x 2 ANOVA for Mentioned Key Elements by Video Seen and Composting Knowledge

	SS	***df***	***F***	***p***
Video Version Seen	2.93	1	0.563	0.456
Prior Composting Knowledge	14.48	1	2.784	0.10
Interaction (Version x Prior Knowledge)	6.28	1	6.976	0.01
Error	348.42	67		
Total	7662.00	70		

Seductive Details

This research question examined whether the additional contextual information was also perceived as seductive detail in the contextual version of the video. The definition of a seductive detail is extraneous information in a presentation that is remembered and, in the process of being remembered, impairs memory of other factors (Rey, 2012). The contextualized version of the video had 9 extra auditory segments, not included in the direct version, which contextualized information. These contextualizations provided either explanations of the reasoning behind a process or variations to the task. To determine if this contextualization might have played the role of a seductive detail, the mentions from the contextualized segment were recorded for each participant who viewed the contextualized version. Four of the contextualized segments were mentioned in the reteachings, two based on reasoning and two based on variations. Out of 47 viewers, 27 mentioned at least one of details contained in these segments (55.45% of the reteachings). The contextualizations mentioned, and their frequencies, are listed in Table 5.5.

Table 5.5

Contextualization Segments with Frequency of Mention

Contextualization Segment	**Mentions**	**Percent**
Manure	2	4.3
Clean Soil	4	8.5
Urea	19	40.4
Water Balance	2	4.3

In this study, the contextual segment about urea was mentioned in 19 of the retellings. It was very memorable information. Given its regularity of mention, this information was seen as a potential seductive detail. There were no significant group differences in the total mentioned elements between those that mentioned seductive details (n=27, M= 10.30, sd =2.46) and those that did not (n=20, M= 10.40, sd = 2.25); t(45)= .148,

p= .88. When examining the urea contextualization alone there was no difference between those that mentioned the detail (n=19, M= 9.74, sd =2.60) and those that did not (n=28, M= 10.75, sd =2.11); t(45)= .147, p= .15. Given the small sample size being examined, the possibility that this information is actually acting like seductive information should not be discarded. If these contextualizations were acting as seductive details as well as contextual anchors, they would be associated with lower performance on the learning measure. With the possible exception of urine, that was not the case with the contextualizations.

Transfer Questions

Transfer of information is an important aspect of learning in the cognitive load framework. For this reason, two transfer questions were included in this study. For the transfer questions there are 81 participants (Direct n= 42, Contextual n= 39).

Bara Namoo. The first transfer question asked, "If you were going to use bara namoo [a field weed] while making compost, how would you need to do it?" The bara namoo is a long reedy field weed. To be successful as a component of compost, this field weed would need to be modified in a way that would let water into the material. Correct answers to this question included cutting or pounding the stalks to make them smaller for purposes of composting. If participants mentioned burning the bara namoo or putting it in a hole with water, these were not considered correct, because these responses related to alternative traditional farming methods and not to the transfer of learning from the video. Out of all the participants, 45 (55.6%) answered this question incorrectly and 36 (44.4%) answered it correctly. A Fisher's Exact test showed no difference in correct responses between direct version viewers (Correct n=20, 47.6%) and contextual version viewers

(Correct n=16, 41.0%), p= .656. Table 5.6 is a cross tabulation table to aid in the visualization of these results.

Table 5.6

Cross Tabulation Table of Correct Responses to Bara Namoo Transfer Question

	Bara Namoo		
Version	Incorrect	Correct	Total
Direct	22	20	42
Contextual	23	16	39
Total	45	36	81

Note. Fisher's Exact two-sided p= .656

Manure. The second transfer question examined the ability to reframe a learned process based on different constraining conditions. It asked, "If you wanted to make the compost but you had only one-half of a wheelbarrow of animal manure, how would you make this compost?"

There were two correct responses to this question: the participant could discuss the reduction of the amounts of other ingredients or she could discuss adding other types of manure. Of the 81 participants, 47 (58.0%) answered this question incorrectly and 34 (42.0%) answered correctly. A Fisher's Exact test showed no difference in correct responses between direct version viewers (Correct n= 19, 45.2%) and contextual version viewers (Correct n=15, 38.5%), p= .653. Table 5.7 is a cross tabulation of these results.

Table 5.7

Cross Tabulation Table of Correct Responses to Manure Transfer Question

	Manure		
Version	Incorrect	Correct	Total
Direct	23	19	42
Contextual	24	15	39
Total	47	34	81

Note. Fisher's Exact two-sided p= .653

New Information

At times the transfer questions would prime the memory of a participant and they would report new information about the composting process. This information was not recorded in the mention total, but this happened in 30 of the 92 interviews. This indicates that the reteaching measure did not capture all of the information that participants had learned.

CHAPTER 6

ATTITUDE INFORMATION

The research question about attitudes was designed to explore Gambian women's attitudes about, and valuations of, video education. Attitudinal information was collected in a number of short, open-ended questions after the learning segment of the interview. These questions were mostly cultural value questions, intended to collect a framing of individuals' perspectives related to video learning: to understand what they valued about video education and why they valued it. In terms of the zooming in zooming out methodology (van Mele, 2006), the qualitative information collected during the interviews was also useful for refining video project development and tailoring it to the needs of the community.

This chapter describes the qualitative results of this study. First, perceived access was examined via a question about alternative sources of the information. Next, possible avenues of video distribution were explored by asking about desired sharing networks. The interview information then shifted gears to examine the number of views necessary for understanding. In exploring how participants attributed value of video education, responses to a series of questions were combined to comprise themes that held meaning to the viewers. The interviews closed with exploring possible topics for videos in five different categories: food security, household crafts, improved agriculture techniques, tree products, and crafts for sale. 91 Gambian women participated in this component of the study.

Access

This research was conducted to improve video as a tool for learning as to provide a group with access to information they would not have otherwise. If this information were considered readily available, it would reduce the need for the learning media. To explore the concept of access, participants were asked, "When this video wasn't here, how could you learn how to make compost."

The lack of information access perceived by development experts was supported by participants' responses (van Mele, 2011). These can be seen in Table 6.1 below. 51 of 91 participants responded that they could think of no other way in which to access that information. (33 said "this only"; another 18 said that they would have no access to the information.) Seventeen of them said that someone could teach them. 13 respondents thought that they could develop the composting process on their own, using their own ingenuity. 19 respondents had previously had access to some information about composting (either through instruction or having seen it being done). The numerical overlap comes from some people who had prior knowledge of composting but indicated that they would not have had access to information regarding improved methods of composting without the video. Overall, participants saw access to the information presented by any means other than the video as limited. The utility of the form of the media was especially apparent, with more than one half of respondents saying that this video was their only option for access to the presented material.

Sharing

To use a learning media well, it helps to understand how the intended audience envisions the media being distributed. To explore this question further we asked, "If you wanted to share this video with someone, whom would that be?" The goal of this question was to better understand the possible avenues of reaching audiences. The responses to this question fall into roughly three groups: family, community, and "funds of knowledge". The family grouping includes individuals who answered with “family” or “child” (n = 26). The community grouping included responses of “kafoo (club) members”, neighbors”, and “my people” (n = 34). The fund of knowledge classification is built upon the theoretical idea that skill-knowledge can be a resource that villagers can barter and exchange for social and cultural capital (Moll and González, 1994). This was the preferred distribution for information sharing, as 49 participants referred to a group that fit in this classification. The responses that fit in this grouping were: “gardeners”, “people who don’t know”, “people who want to know”, “people not here”, and “everyone”. In this category the specific individual was not the driving factor of the distribution; instead, it was ways to spread or increase overall capital with the capital available in the video. The number of individuals for each response subcategory can be seen in Table 6.1.

Table 6.1

Categorical Responses to Media Sharing Preferences

Who would you share this video with?	Count
Family	20
People who don't know	20
Neighbors	16
Gardeners	11
My people	10
Kafoo (club) members	8
People who want to know	8
People not here	6
A Child	6
Everyone	4

Multiple-Viewings

One of the key benefits of video is its ability to be viewed multiple times. In order to understand the role of multiple viewing on perceived learning, participants were asked, “With this video you just saw, how many times would you need to view it until you felt you knew all the information”. Respondents regularly answered this question using a range of times instead of answering with a specific number of times. 11 respondents answered one or two; 40 respondents answered two or three; 24 respondents said three or four; and 7 respondents said four or five. It should be noted that this question was not in the initial set of interviews, and thus there are responses for only 82 respondents.

This question also served as an informal measure of video viewing difficulty between the two versions of the video. There was no difference in the number of views necessary by video version. Overall, three fifths of viewers felt that they would know all the information in at most three viewings. Informally, this indicated that participants felt that the information in the videos was accessible and reasonably easy to learn.

Values Related to Video

The majority of the questions in the attitudinal portion of the interview were cultural value questions. They were meant to explore attitudes about video. Four questions were included in the interview: 1) How much do you want to make this compost?; 2) What about this video is useful?; 3) Do you think that learning from video is good (“Yes”)? What makes you think that it is good?; and 4) Why is learning from video useful to people in The Gambia? These questions ranged from specific, relating directly to the video just seen, to abstract conceptual valuations. Villagers preferred to answer questions more generally. All four of these questions had a good deal of thematic overlap. This overlap was used to determine themes of importance for Gambian participants in relation to video education, to better understand the domains of valuation attributed to video education by the respondents. Four main themes emerged: Access to Knowledge, Benefits of Knowledge, Empowerment, and Visual Presentations. These themes are interrelated and interconnected; they were often touched upon repeatedly between questions and even in answers to the same question. The following response provides an example of one open-ended answer touching upon all four of these themes: in rough translation the respondent said,

> "Non-educated people are many and video is a benefit to these people…Video is more useful for us because we can hold it and watch it and put our minds on it. If you open a book for me, I will bend my head; I know I don't have anything there. But video, which you stand in front of and you watch; that has benefits to the non-educated and it helps us."

Access to knowledge. This theme included responses to the effect that presentation of the information by video gave participants access to information that they would not otherwise have. It was by far the most commonly mentioned theme. It was mentioned in some form or another in 85 of the 92 interviews. A very common form of this response involved the comparison of not knowing before but knowing now. One example can be seen in this response to why video was good: "It is good because what you don't know, you know that; what you don't understand, you understand that." This suggests not just an appreciation for the information being accessible but also for the awareness of the existence of the skill. Knowledge and access to knowledge are woven together in this category, and are both are framed as valuable commodities in these interviews.

Benefits of knowledge. This theme related to knowledge and the value of knowledge. This theme is similar to the previous one; what differentiates responses in this group was the degree of importance placed upon the future benefits of access to the information. This was a common theme, with 58 of participants mentioning it as an important value of video education. It included an aspect of access to information, but also an aspect of tangible benefits associated with having this access. Threads of economic benefits, helping, and tomorrow populated this theme.

Videos' perceived benefits included bringing development, getting The Gambia out of poverty, and bringing a brighter tomorrow. In the more concrete questions, these responses included tangible things, such as "I desire to make this compost because searching for compost is a good deal of work." The more abstract questions had similarly more abstract responses; "We are following our tomorrow." This theme underscored the value given to these videos and their use. It also suggests that one economic barrier that this audience might be trying to overcome is simply lack of access to skill learning that might be beneficial for making money. By making access to skill learning more available, videos enable viewers to improve their lives financially. Composting provides economic opportunities would be unavailable without the skill learned from the film. The audience appreciated this.

Empowerment. One of the many values participants attributed to these videos was that they had an ability to enlighten people. This theme included responses to the effect that exposure to material in the video media supported participants in feeling powerful within their worlds. This theme was mentioned by approximately a third of respondents. In these interviews, participants mentioned how viewing this video made them feel more powerful in their worlds--"It wakes us up," for example.

These responses indicate that video learning provides learning tools that the intended audience incorporates into a personal, identity level of importance. In terms of learning media creation, the intensity of these reactions in relevant; it shows the degree that the audience accepts and desires the resources presented. I close out this theme with one more quote, “It is very useful because your tomorrow benefit is there. These people helping you are giving you knowledge. Knowledge that enters your mind and someone can’t remove that”.

Visual presentation. In a study about learning from a multimedia resource, this theme was the most interesting. It included responses to the effect that the visual modality of the information presentation made the learning more accessible and more memorable for the participants. This theme was mentioned by approximately 40% of respondents.

The very positive response about this learning media was supportive of this research. Comments such as, “ …if someone explains it to me, if someone tells me, I will not easily understand it, but if my eyes see it. You watch it, you will easily understand.” This quote makes apparent the preference for media presented visually over media presented in an auditory format alone. Another participant made it a point to emphasize that people had tried to tell her how to make compost previously and she had not understood it in the same way as she understood the process when presented in the video.

Video Option Preferences

As previously mentioned, the videos made for the study were made in conjunction with a video education project. The goal of this project is to create small, local-language, skill-based, DVD video libraries. This provided extra impetus for determining what videos participants desired to view. Initially, as part of the interview, we asked the participants what other subjects they would like to see videos about. Without suggestion prompts, participants had difficulty suggesting topics. The manner of questioning did not make this information accessible enough. After encountering this difficulty in the first several interviews, we changed the one open-ended question into five multiple-choice options. In each question, we provided three video viewing options. Participants had to choose which of the three videos offered they would prefer to see. The responses to these choices allowed insight into what skills were most desired by our participants. The videos were tested in three villages. The responses were sorted by village because local environmental context might relate to skill preferences.

Choice 1. The first choice involved food security skill videos. In this choice respondents determined whether they would prefer to watch a video on: a) Tomato paste making (an important ingredient used in everyday cooking); b) Moringa powder making (a nutritional supplement highly valued in the development community, but less known in the villages); or c) Honey processing (a highly prized commodity, but the skills involved with processing it are not well known). In Choice 1, it is relevant to note that Massembeh village has a plethora of Moringa trees. This likely relates to the differences in desire to make Moringa powder in that village particularly. Similarly, Wurokang is in a region where beekeeping is more common. Villagers there are more likely to know the benefits associated with bee-keeping, and for that reason likely responded more favorably to that as a video subject. Dankuku, on the other hand, neither has many Moringa trees nor is located in a bee-keeping region, and responses of its residents showed a different preference. The preferences for choice 1 can be seen in Table 6.2 below.

Table 6.2

Video Topic One Preference By Village

Video Choice 1	Dankunku	Massembeh	Wurokang	Total
Tomato Paste	15	11	19	45
Moringa Powder	5	18	6	29
Honey	0	1	5	6

Choice 2. This choice involved the option of viewing videos about crafting skills related to health products: body soap making, Neem lotion making, or body lotion making.

Neem is a plant-based insect repellent, which is especially desired as a mosquito repellent in this area of high malaria rates. Soap making was highly desired in all three villages. When given the choice between making a regular moisturizing lotion and making a lotion that could also serve as a mosquito repellant, the lotion with the added function was highly preferred. The responses to this choice can be seen in Table 6.3 below.

Table 6.3

Video Topic Two Preference By Village

Video Choice 2	Dankunku	Massembeh	Wurokang	Total
Soap Making	8	15	13	36
Neem Mosquito Cream	8	12	14	34
Body Lotion	4	3	3	10

Choice 3. This choice provided options related to development-sector, improved agriculture skills. These skills have traditional practices correlates; however, the practices shared in the videos would provide research-validated techniques to improve outcomes. The three options in this choice were: the growing of garden things, composting, or using polypots for tree nurseries. In relation to context, it should be noted that the first two options are more culturally associated with women or both genders, while the use of polypots, plastic bags for tree planting, was most often associated with men. When this study was designed, it was intended for all villagers. When very few men volunteered to participate, we determined that it made logistic sense to include only females. Dankunku is a village very far from the road. The participants were older and less influenced by modern society because of that distance from the road. Dankunku and Massembeh have well-established garden clubs. Wurokang is known for its poor soil, which would increase the value of composting video for this group. The complete set of responses can be seen in Table 6.4.

Table 6.4

Video Topic Three Preference By Village

Video Choice 3	Dankunku	Massembeh	Wurokang	Total
Gardening	11	15	13	39
Compost	8	9	12	29
Polypots	1	6	5	12

Choice 4. The options for this choice related to tree products and food security. These videos were about skills without relevant traditional practices--skills that were new and innovative. Nonetheless, the skills might have value for improving food security or overall quality of life. The three options were: a) Making mango jam, b) Processing cashew fruit, or c) Processing cashew seeds. In the Gambia, mango is a much more common tree than cashew. There are many mango trees in all three villages that the videos were tested in. Both Wurokang and Massembeh are close to the road. This means that they can easily transport ripe mangoes to the road for sale. In Dankunku the mangos are more difficult to sell because the village is about 6 miles from the road. All the mangoes become ripe at the same time, so mango jam is particularly useful in that village. The proximity to road also shapes preferences to cashew work. Cashews are not as well known away from the road, and the financial benefits of cashew farming are less discussed there. Similarly, the villages by the road were more interested in cashew work than was Dankunku. In all three villages, a strong preference for viewing the mango jam video was apparent. This was actually one of the most mentioned skills overall, and was seen as very valuable. The responses to this choice can be seen in Table 6.5 below.

Table 6.5

Video Topic Four Preference By Village

Video Choice 4	**Dankunku**	**Massembeh**	**Wurokang**	**Total**
Mango Jam	14	19	15	48
Cashew Seed Processing	4	7	10	21
Cashew Fruit Processing	2	4	3	9

Choice 5. The final video selection included videos about arts and crafts. The goal of these skill-based videos would be sharing a skill that the audience could learn and use to make products that could then be sold for cash. They are meant to improve the overall quality of life for the viewers. The three video options were: a) tie and dye, b) crocheting purses from plastic bags, or c) wood-carving basics. All three of these crafts require some initial financial investment for ingredients or tools. Tie and Dye is a traditional women's art form knowledge of which is usually confined to specific tribal groups. The purpose of that video would be to provide greater access to a traditional practice. In contrast, crocheting purses from plastic bags is a very new skill, but also a skill that would be environmentally and economically beneficial if practiced by more people. Ideally, the video would provide greater access to the skill. It is more common for men to practice woodcarving than women. This might have affected the frequency of response to this choice. As can be seen in Table 6.6 below, all three villages showed a strong preference for the video about the traditional skill of tie and dye. It was easy for viewers to see how this skill could be useful, and a video would provide access that is regularly restricted. These results also suggest that for the skill of the crocheted purses to become popular, there needs to be a campaign to increase the awareness of the benefits of such a skill. The wood-carving video option was not very popular, and the limited interest in this skill could be an indicator of the necessity for awareness of the gender-norms for work within the intended audience.

Table 6.6

Video Topic Five Preference By Village

Video Choice 5	**Dankunku**	**Massembeh**	**Wurokang**	**Total**
Tie and Dye	13	21	23	57
Crochet Purses	6	6	5	17
Wood Carving	1	3	2	6

These five video preference choices show how a complex mix of social, cultural, and environmental factors contribute to determining how valuable a video is to the intended audience. This information helps in creating media desired by the audience. The more useful and valuable the users see the resource as being, the easier the distribution process and the more likely an adoption of the skills shared in the video. Furthermore, the range of preferences supports providing multiple skill-based learning videos in one learning resource so that audiences have selection in the learning media most meaningful to them.

Interview Results Summary

In this chapter, interview information with 91 Gambian women was used to explore attitudes and valuations of video education. First, the lack of perceived access was exemplified in a question about alternative sources of the information: more than half of respondents perceived no other route to obtain this information. Next, possible avenues of video distribution were explored by asking about desired sharing networks. This question resulted in three primary social distribution pathways: family groups, community groups, and "funds of knowledge". In exploring how participants attributed value to video education, responses to a series of questions were combined to reveal four themes that held meaning to the viewers. The first of these themes, Access to Knowledge, was the most mentioned value of video education. Other video characteristics, such as the quality of the video or the subject presented, were less important than its existence. The second theme, Benefits of Knowledge, stressed the economic or future benefits of the knowledge presented. The information was easily commoditized and valued as increasing viewers' economic possibilities. The third theme, Empowerment, involved cases where the valuation of the video education focused on personal development and improvement. The final theme, Visual Presentation, involved the importance of the visual modality for learning. The interviews closed with exploring possible topics for videos in five different categories: food security, household crafts, improved agriculture techniques, tree products, and crafts for sale. These choices allow for a greater understanding of intended video market and can be applied in the creation of future video projects.

DISCUSSION

My research used a mixed methodological approach, combining aspects of Participatory Video, experimental Cognitive Science, and qualitative interviewing to develop a better understanding of how video educational media is currently being used to support adult learning in development work and how the video creation and assessment process might be improved in the future. It was conducted in West Africa with rural villagers as collaborators and participants. This study had three domains of interest:

1) Guidelines derived from Cognitive Science were included in a cross-cultural, Participatory Video project to aid in the learning process and the assessment of knowledge acquisition from the video media
2) Cognitive science experimentation methodology was used to better assess knowledge acquisition and to examine the role of information contextualization in skill-based learning.
3) Villagers' attitudes about video learning were collected to evaluate the participatory process and support further project refinement.

In the research, participatory methodology was included in the video creation process and in the analysis of the learning outcomes associated with attitudes. Collaborators were included in the selection of video topic, the identification of key learning elements, the determination of cultural relevance, and the assessment of media post-creation. While most Participatory Video projects also use a collaborative process to guide the instructional design, this research instead employed principles of Cognitive Science to guide the video creation. Cognitive science also played a role in determining the methodological choices for the experimentation portion of this research. The combination of theoretical frameworks provided insight useful for multiple fields of inquiry.

Learning in Participatory Video

A major strength of this research project was its integration of principles from Cognitive Science and Participatory Video. Combining theoretical frameworks allowed the two approaches to strengthen one another. This was seen in many places in the present study: Cognitive Science guidelines were used to structure learning in a Participatory Video framework, and Cognitive Science methodology structured the experimental analysis and provided reteaching as an outcome measure of knowledge acquisition—which might be utilized by both of these fields. Participatory Video methodology guided this study in the video creation process, and its adaptive methodological approach, and in the analysis of the sociocultural learning outcomes associated with video education.

Learning Outcomes. Video has been shown to be a useful tool to improve knowledge acquisition in adults (Van Mele, 2011). Nonetheless, because video project reviews are sparse, there is not a large body of research about effective ways of using video for skills training of adults in development work (Lie & Mandler, 2009). Within the current field of video education in development, Participatory Video is the primary theoretical framework used to guide the video creation process and to assure that culturally relevant learning materials are made. One difficulty with the Participatory Video methodology is that the research is hard to scale up and generalize about best practices with the current measures of learning outcomes.

There are three primary learning outcomes measured in Participatory Video studies: participants' attitudes toward video education, the adoption of the practices taught, and knowledge acquisition. Most of this information is collected through semi-structured interviews, focus groups, and observation (Van Mele et al., 2007). My data was collected immediately following the participants' first viewing of the video; for this reason, outcome measures of skill adoption were not possible. Learning measures were collected through reteaching and transfer questions, and in-depth attitude information was collected through the use of scripted interviews with the participants of the experimental study.

An artifact of Participatory Video methodology's roots in agriculture and health is that measures of attitudes and adoption of practices are more common and better assessed than measures of learning. In contrast to the well-developed measures of attitude and adoption of practice, present learning outcome measures of knowledge acquisition are less refined or generalizable (Kumi & Kumi, 2012). For example, the rice studies in Bangladesh measured changes in knowledge with free recall responses to open-ended questions about information provided in the videos, such as "Do you know what causes holes in the seed?" (Van Mele, Zakaria, Begum, Rashid, & Magor, 2007). The cognitive load of answering an unprompted recall question is high (Barrett, Tugade, & Engle, 2004). This could lead to lower than accurate performance measures on the task. The farmer films study also used free recall of video images, facts, colors, music, and objects to measure learning from the film.

My research offers reteaching as an additional and alternative measure of learning from video. Reteaching allows one key element to prime the next key element, and reduces the cognitive load of providing evidence of learning. It allows the conceptual understanding of the process to support the assessment task. This task accesses information very differently than does the free recall methodology. Combining the two methodologies might be a powerful way of gaining an understanding of different types of information access and learning.

Another benefit of using the reteaching as a measure of learning in Participatory Video projects is that this learning measure has application for research within the field of Cognitive Science as well as the field of Participatory Video. This research modified Coherence Principle methodologies to be applicable for rural Gambian study participants. Interviews were used in place of written reports or multiple-choice responses. Reteaching was used to measure the recall of aspects of the skill viewed in the video, in a manner that matched current research in the Coherence Principle methodology (Shen et al., 2006). The learning measurements derived from the Coherence Principle methodology have been validated over decades of studies in the western world. (Shen et al., 2006; Rey, 2012; Moreno & Mayer, 2000). By using this methodology in interdisciplinary and international contexts, a greater variety of data can be compared and contrasted. International field experiments in Cognitive Science are still relatively rare. As the field develops, it would be beneficial if validated and complementary methodologies could be adopted.

Adaptive methodology. Participatory video also includes adaptive, process-based methodology that is uncommon in traditional laboratory-based experimental settings (Phenice, Griffore, Hakoyama, & Silvey, 2009). What is being measured and how it is being measured might change over the course of a study, guided by what collaborators deem relevant. This aspect of Participatory Video methodology was incorporated into the current video study. When conducting research in the developing world, it is common for resource constraints or social necessities to give rise to experimental issues that require altering the experimental methodology to a limited extent. When encountering these constraints, incorporating an adaptive methodological approach into traditional Cognitive Science experimentation allowed for flexibility in practice that was still methodologically rigorous.

In the present research, an adaptive approach was adopted in multiple instances. This approach was particularly relevant with respect to misunderstandings the occurred using the original interview script and with changes in the study population. For example, the initial attitude questions included aspects of video choice that did not make sense to the participants, so the questions were adjusted to make more sense to participants. Similarly, when recruitment of novices was not possible, the experimental script was modified to account for new data to be collected based on a participant's prior knowledge. Methodology was also adapted with regards to the transfer questions, which had to be completely rewritten to be meaningful to the audience. While this meant that participant numbers differed depending on the question being examined, it made the information actually collected more meaningful.

The adaptability of Participatory Video developed in part to support the research in creating culturally relevant learning media (Van Mele, 2006). This is important for Cognitive Science research, because the collaborative process that aids in the creation of culturally relevant learning media can be used to create better quality assessment measures. This body of research is not as accustomed to framing measures for multiple perspectives. By incorporating Participatory Video methodology, collaborator-input can help support better measure development in an established methodological process.

Cognitive Science Experimentation

A second major strength of this study was the testing the effectiveness of Cognitive Science theory with a population that has seldom been included in prior research. The guidelines used for instructional design came from multiple fields of Cognitive Science inquiry. At times, guidelines would overlap in their scope and lead to contradictory predictions. This was the case when creating the guideline about information presentation for the video. Researchers in Participatory Video methodology and collaborative load would recommend including contextual information in a presentation to reduce the cognitive load of creating a shared understanding (Van Mele, 2006; Dillenbourg & Bétrancourt, 2006). In contrast, researchers employing the coherence principle would recommend not including any extraneous information in the presentation of a process, to reduce the chances that the learner would be confused or distracted from the learning process (Mayer, 2009).

An experiment was created and conducted to explore the difference in these recommendations and their underlying predictions of cognitive load. The results of the experimental aspect of this study related to both the participatory process of this study and the Cognitive Science framework.

Knowledge Acquisition. In terms of knowledge acquisition from the video media, both video versions had high numbers of key elements mentioned during the process reteaching, with average scores of over 10 out of 14 elements mentioned. This indicates that Cognitive Science guidelines used in video creation were successful at making the information in the videos accessible to the intended audience, regardless of the guideline chosen to direct instructional presentation. If analyzed solely by video version seen, there was no difference in the learning between the two groups. In terms of recommendations for instructional design practices, this might be interpreted to mean that adoption of either guideline could lead to the creation of accessible video media.

Prior Knowledge. Initially, participants with prior composting knowledge were not going to be included in this study, because of possible data complications relating to the expertise reversal effect. In this effect, extra information provided in instructional materials guides the learning of the novice and improves beginners' performance; while, at the same time, hindering the learning of the expert (Kalyuga, Ayres, Chandler & Sweller, 2003). In the experimental procedure, this was one of the factors that had to be changed to adapt to ecocultural constraints: for participant selection reasons, experts had to be included. This inclusion of prior knowledge as a factor of analysis revealed interesting results. There was an interaction between a participant's prior knowledge of composting and video version viewed: whereas novices learned better than experts from the direct version of the video, experts learned better than novices from the contextual version of the video. The difference between novices and experts who viewed the contextual video, however, was nonsignificant: the average scores of both groups were above 10 elements mentioned. The difference between novices and experts who saw the direct version, on the other hand, was significant: while the average score for a novice who viewed the direct version was over 11, the average score for an expert was below 9. Interestingly, this difference was in the opposite direction than would be expected from predictions based on the expertise reversal effect. The expertise reversal effect would predict that experts would learn better from a more direct presentation of the information than they would from a contextualized one, while novices would learn better from a more contextual version that provided more guiding information. Instead, experts' learning was significantly worse with the direct version. It is not likely that the expertise reversal effect is related to the observed interaction between prior knowledge and contextualization.

In terms of instructional design related to the interaction effect observed, audience characteristics could be used to guide recommendations. If, for example, the intended audience of the video has no prior knowledge about the subject, an argument could be made that the coherence principle would be a better guideline to direct the video creation. If, however, the intended audience is more varied, instruction might be improved by following a guideline based on the ecocultural contextual load—because both novices and experts found the information in this version to be accessible. Regardless of the instructional method selected, the load associated with that information presentation would be incorporated and balanced with all the other cognitive loads of the learning process. To further examine this issue, more research needs to be conducted in which both the ecocultural contextual load and the load associated with information coherence are being manipulated separately and together.

Multiple cognitive loads. There are times when multiple cognitive loads must be considered in relation to the same aspect of video design. For example, the transient information effect, the modality effect, and the contiguity effect all pertain to cognitive loads related to sensory input in information presentation. Their spheres of influence overlap and need to be considered together to adequately model learning and create media with good instruction design. Perhaps the same is true in information structure, to aid in comprehension. This would explain the result of this study more completely than any alternative. The coherence principle is about a clear, concise information presentation. The presence of good information presentation, however, does not reduce the load involved in creating a shared understanding.

The difference in the performances of experts and novices could be interpreted as evidence in support of a multiple loads perspective. It might be argued that the process of learning a new schema has different cognitive loads associated with it than does learning new information that must be reconciled with previously established schema. Some of the primary cognitive loads associated with learning new information involve accurate selection of key elements and recall of how those elements are related to each other. Theoretically, this cognitive load would be directly affected by the coherence of the information presentation. If extraneous information were included in the presentation, it might distract the learner from identifying the key elements or understanding the process transitions. This logic is also the theoretical argument for the coherence principle. The high performance measures of novices who viewed the direct version of this video substantiate that the coherence of the presentation is affecting learning in these learners.

The cognitive loads associated with incorporating new information into existing frameworks are different than the loads associated with creating a new framework. For example, the loads associated with the selection of pertinent information are reduced, because the process has been practiced and become more automated in the expert. Incorporating new information, however, also involves different thinking processes. The work of information integration involves tasks such as grouping new factual information with similar information learned previously, finding contradicting ideas and resolving those contradictions, and organizing new information in logical retrieval units. These tasks are more associated with optimizing generative processing than with reducing extraneous load. Scaffolding generative processing allows it to be done more efficiently, or reduces the load of making connections. This scaffolding might be theoretically associated with the concept of creating a shared understanding to reduce the load of learning.

While interesting, this interpretation is just theoretical supposition. In order to better understand the load associated with information presentation, more research needs to be conducted in which both the ecocultural contextual load and the load associated with coherence are being manipulated separately and together.

Coherence Principle or Seductive Detail Effect. Previous research into the coherence principle had shown that information was most accessible when it was presented in a simple linear process explanation, with no extraneous information to hinder learning (Mayer, 2009). A coherent presentation would not contain either extraneous information or seductive details that could draw the audience's attention away from the information to be learned. Previous research equated the seductive detail effect with the coherence principle. The results of this study provide evidence that challenges that assumption.

As mentioned previously, the direct version of the video was very accessible to novices. This version of the video followed the coherence principle guidelines specifically, and the results supported predictions based on the principle. In contrast, the contextual version was designed to assess the seductive details effect. The information included as contextualizations was selected for inclusion because it was identified as extraneous to understanding the process of composting. Even though the contextualizations included were written to be extraneous to the understanding of the process of composting, they were not identified as seductive details in the experimentation process. Seductive details are distracting and reduce learning by definition. The only contextualization reported enough by viewers during reteaching to be considered seductive information was the inclusion about urine, and the mentioning of the element did not detract from learning other elements during the experiment to be considered a seductive detail. While the information was attractive, it was not attractive enough to overload the working memory limit. Thus, this research provides slight support for a coherence guideline, but none for a seductive detail interpretation of the data. Further research would help determine if these concepts are the same, as they are often treated in the literature, or are instead overlapping load types that share spheres of influence.

Transfer Questions. In the coherence principle and the seductive detail literatures, transfer question responses have proven very important for determining the effect of the extraneous information on learning (Rey, 2012). This was not the case in the current research. In this study, reteaching was used to measure the recall of aspects of the skill viewed in the video and open-ended transfer questions were used to measure how well integral concepts were generalized. Participants were able to perform the reteaching task with a high degree of success. The transfer questions were not perceived as being as effective as a methodology as the reteaching. Both transfer questions were regularly misunderstood, with participants asking for clarification or requiring guidance to adequately respond.

The transfer questions could have been more applicable if they had been framed differently. Participants often responded to these questions by relating traditional methods of handling the making of compost. In this process villagers connected the new information they had just seen to how they practiced similar activities previously. For example, when asked how to incorporate field weeds into compost, many participants would respond that the proper thing to do would be to burn the plant. The correct answer was to cut or pound the weed to break it into smaller portions. Burning the field weeds is not mentioned in the video; that is the traditional method of incorporating them back into the field. In incorporating the traditional practice with the new information, the participant is showing evidence of learning transfer. It was just not the type of learning transfer anticipated or accurately measured for. Similarly, other participants responded to the bara namoo question by saying that the weeds could be placed in a hole and water could be poured on them. This is a commonly taught composting technique, but is not the one recommended by this video. The video media did not include digging a hole for the compost, but 26 of 92 participants mentioned digging a hole in some way in their interviews. Both of these responses are examples of evidence of learning transfer that was not accurately measured with the current transfer questions. More research should be conducted into ways in which to reframe these transfer measures to use them to gain a greater understanding of the learning transfer already taking place.

Participatory Video and Sociocultural Influence

A third major strength of this study was in its detailed project review that communicated about the process of this collaborative project. When conducting a Participatory Video project, it helps to have a general understanding of how these collaborative projects are conducted and of the processes associated with them. As video projects are scarce, sharing the successes and pitfalls of a process can aid other practitioners. This video project review attempted to communicate the process of Cognitive Science guidelines selected and ways of assessing media that are generalizable. Few rural development field workers have both access to the educational research necessary for creating these guidelines and the background to know how to apply that research. In the explanations of research and its recommendations, field workers get exposure to instructional design aspects they might not have known about before. This study provides a template to simplify the process of thinking about the learning to be conveyed by a Participatory Video and to make the video's content more accessible to the learner.

The participatory process employed in this research was different than the process employed in the other studies reviewed: while it allowed a good deal of participation in the construction of the instructional video and the context of the learning, it did not allow the collaborators much freedom to determine how the information would be taught. Instead, a research choice was made to use Cognitive Science guidelines to drive media creation and assessment. The videos produced in this participatory process were seen as successful from both a Participatory Video perspective and a Cognitive Science perspective. It appears that allowing participatory input into the manner in which the information is taught is not always necessary for the creation of high quality skill-based learning videos.

In future research, the qualitative information collected during the interviews will also be useful for refining the Video Griot project and tailoring it to the needs of the community. This would be the zooming-out aspect of the Participatory Video methodology (van Mele, 2006). The benefit of using the Participatory Video process with qualitative interviewing is that the methodological tools used to assess learning and attitudes also support the video refinement process. The reteaching methodology allowed for a different, richer understanding of what in the video made sense to participants and how the audience comprehended it. By combining these methodologies, all become stronger.

Sociocultural Influence. Previous Participatory Video research focused on the sociocultural benefits that are associated with the collaborative endeavor. Studies have shown that the process had sociocultural benefits for both collaborative partners and the video end users (Van Mele, 2006). In terms of the present research, as these benefits of video education were viewed within the field as being integral to the video creation learning experience (Van Mele, 2011), it was seen as important to maintain their presence as a valued learning outcome. To measure these attitudes, open-ended interview questions from 91 participants were categorized thematically. Four primary themes were revealed in this study: appreciation of the visual modality, access to information, the benefits of access, and the empowering nature of access. These four themes align well with the sociocultural benefits previously associated with learning from video. This is evidence that Cognitive Science and participatory voice methodologies can be combined in meaningful ways for learning, while still being perceived as having sociocultural benefits.

Visual presentation. The theme of visual presentation involved the importance of the visual modality for learning. The modality was seen as accessible, and easier to learn from than a verbal explanation alone. In part this might be because it allows the viewer more control of the learning process. The visual information in this study was real-world media, filmed in the local context and with local experts. The viewers had differing levels of knowledge about the content, but the ecocultural context was familiar to all them. The videos contained the skill viewers were intended to learn, but they also contained environmental information such as weather, the time of year, and the area in the country in which the videos were recorded. In terms of narrative perspective, this means that the script developed for the video narrated only the auditory information intended to be taught, but did not control all access to information that could be derived from the video. The viewer was allowed to interact with the video setting and to negotiate meaning that might not have been identified as relevant by the video creator.

Access. Access to Knowledge was the most-often mentioned value of video education. Almost all participants mentioned it in one form or another. This study looked at access to information in two ways. First, perceived information access was outlined by a question about alternative sources of composting information. More than half of respondents perceived no other route to obtaining composting information. These results are consistent with results from other research involving video education in development, in which access to information was regularly seen as video's primary benefit (van Mele, 2011). Then the theme of access was explored in participants' responses to other open-ended questions. In these responses the mere existence of the learning media was seen as access to the information in the video. This is a narrow definition of access. In the future, as video media becomes less scarce and videos are made addressing a larger range of subjects, other video characteristics, such as the quality of the video or the subject presented, might be seen as more salient. This would expand the concept of accessible from simply "instruction" to "well-designed instruction." This study is a contribution to the process of creating an expanded definition of information accessibility that can be analyzed in methodologically rigorous ways.

Benefits of knowledge. Another theme revealed in the attitude interviews was "Benefits of Knowledge"; this theme centered upon the economic or future benefits that the viewer could derive from access to the knowledge presented in the video. Interviews from this study supported the supposition that viewers easily commoditized the information presented in the composting video and that participants perceived video education as increasing the viewer's economic possibilities.

One of the goals in Participatory Video is to take knowledge that is found in local communities, within their experts—their community funds of knowledge—and to share that knowledge with the larger society (Van Mele, 2011). This is an attempt to commoditize knowledge and use it as leverage for a greater audience in real, economic, and ecocultural contexts (Moll and González, 1994). The frequency with which this theme was mentioned indicates that Gambians had little difficulty incorporating the possibility of video learning into their world or recognizing the sociocultural benefits of its accessibility. This relates both to the specific subject of learning composting through video and to the general utility of accessing information through video. Similar results were seen in Benin, where video viewing was seen to stimulate entrepreneurism, increase the creation of social associations, and build collaborations (Zossou, Van Mele, Vodouhe, & Wanvoeke, 2009a & b). All three of these have aspects of social, cultural, and economic capital that participants were able to perceive as being increased through having viewed the video. It is easy to imagine how video education could be integrated into villagers' lives and serve as a social commodity for improving lives. There was not one villager who thought video presentations were not useful, or who could think of no one with whom they would want to share the information.

When asked with whom participants wanted to share this information, three primary social distribution pathways emerged: family groups, community groups, and "Funds of Knowledge". The funds of knowledge category was composed of generalized ideas of knowledge sharing that connected to ideas of the knowledge containing social or cultural capital. Participants even went as far as to say that they would orally share the knowledge they had just gained with their community members if the video were not present. The great number of individuals who saw benefit to spreading this information widely suggests that it might be productive to distribute videos through video clubs, where people go to see the films in a communal setting, or through DVDs passed from village to village. These initial impressions of possible social distribution pathways correspond well with previous Participatory Video research in which video was seen as increasing social networks (Chowdury, Van Mele, & Hauser, 2011).

Empowerment. The final theme, Empowerment, involved cases in which the valuation of the video education focused on personal development and improvement. This was another theme that was very much in line with previous research from the field. Studies in Bangladesh, Benin, and The Gambia all show elements of villagers' feeling more powerful in their world in relation to access to the knowledge in the video (Lie & Mandler, 2009; Zossou, Van Mele, Vodouhe, & Wanvoeke, 2009b; Chowdury, Van Mele, & Hauser, 2011). Theoretically, this exhibits a good deal of crossover with the concept of social capital seen in the "Benefits of Knowledge" theme. The learning is translated into social and cultural capital that changes the participants' self-perception.

Overall, these themes suggest a deep appreciation for the learning media itself and support the assertion that this media would be easily integrated into the economic and social structures of the village. The interviews closed with exploring possible topics for additional videos in five different categories: food security, household crafts, improved agriculture techniques, tree products, and crafts for sale. These choices allow for a greater understanding of intended video market and can be applied in the creation of future video projects.

Limitations

Small sample size. This experimental study was conducted through interviews in another language. The process was time consuming and limited the number of participants it was possible to include. To perform the statistical analyses meaningful to uncover differences such as the interaction effects related to cognitive load, a larger sample would have been preferred. The differences in learning related to cognitive loads are complex and involve multiple variables; small changes are difficult to measure regardless of sample size. With a small sample size, these differences are even more difficult to discern. This was the case with the analysis of seductive details—the urine contextual addition was possibly a seductive detail, but there was not the analytic power to reveal possible group differences.

The adaptive approach. The adaptive approach to experimental methodology adopted from Participatory Video was useful in that it helped reveal a significant effect related to expertise that would not have been observed otherwise. However, there are researchers who consider an adaptive approach less methodologically rigorous. In order to establish the validity of this methodological approach more research is necessary.

Transfer questions. Measures of learning transfer are important for examining learning in the Cognitive Science literature, and my research was weakened because the transfer measures were not success at measuring transfer. The participants were transferring their learning from the video and applying that to their current understanding, as seen by the reporting of traditional practices in the responses to transfer questions; however, the questions did not accurately measure the learning transfer the participants were accomplishing because the questions did not frame information transfer in a way that permitted people to understand what was being asked. The lower scores on similar transfer-like questions in other Participatory Video research indicate that this issue might be larger than the transfer research framing in my study alone. More work is necessary to improve measures of transfer that are culturally relevant and accessible to participants.

Future Research

Transfer questions. Research into how to make transfer questioning more successful would be useful, not only to better understand the learning from video, but also to develop an understanding of the ways in which newly learned information interacts with previously learned material in this particular ecocultural context. Question responses indicated that participants often tried to reframe the transfer questions by providing information about how new information interacted with traditional knowledge or previously learned material. Participants wanted to answer those questions, and tried to in regard to the transfer questions in my study. If new transfer questions were constructed to intentionally measure and prompt for this type of transfer knowledge, they could provide important insight into cognitive loads of learning.

Seductive Detail. The results from the seductive details analysis indicated that most of the contextual information included in the contextualized version was not considered to be seductive by participants. As measured by mentions in reteaching, out of the 9 contextualized segments, only one was considered attractive enough to have the potential to be a seductive detail (though it did not act as a seductive detail in my study). Future research could include a third condition in addition to the two included in my research. There could be a direct version, a contextualized version, and a seductive details version—which would include information not necessary for learning and not useful for contextualizing the learning. This would help discern the difference between cognitive loads associated with information presentation related to process coherence, with the costs of creating a shared understanding, and the costs of including distracting information in a learning segment. If there are indeed multiple loads interacting concurrently in this learning experience, including a third experimental condition would be beneficial in helping determine what aspects of the learning are creating which loads in relation to the learning task.

Multiple interacting loads. The evidence from this study indicates that there might be multiple loads interacting at one time. Cognitive Load research already divides load types into categories of extraneous, intrinsic, and generative loads; these loads are about the learning task and the types of learning materials the loads are associated with. Perhaps it might also be beneficial to frame cognitive load into categories based upon the part of the learning process with which the load is associated. In this type of categorization, there might be loads associated with sensing information, constructing a coherent conceptual framework, creating a shared understanding, and reducing uncertainty. These loads might all be acting simultaneous to create a learner's understanding. Creating categories based on learning processes and designing measure to quantify them could be instrumental in unraveling the complex interaction occurring in the learning process.

Other topics of learning. My study looked at the learning from a skill-based video about composting. Composting is a simple skill, and a composting practice can be successful even without strict adherence to the creation protocol, measurements are not exact, and the necessary ingredients have a variety of possible substitutions. If, however, a video were presented about a more complex topic, it is possible that there might be less learning from the video. Cognitive load is most noticeable when the information being presented taxes the learner and approaches cognitive overload. Videos about other skill-based learning need to be created and tested to better evaluate the benefits and limitations of video education.

Adoption measures. In Participatory Video projects measures of behavior adoption are an integral part of measuring learning outcomes from skill-based videos. Given that this study was conducted after only one viewing of the video, that was not possible. However, to more accurately compare the reception of a Cognitive Science video compared with a Participatory Video format, a measure of skill adoption would strengthen the argument that adding the cognitive science improves learning. In order to collect these data meaningfully, another video study would need to be conducted in which the video learning media was left with the participants for future viewing. In the present research, viewers were only able to watch the video the one time for purposes of the study. As viewing repetition is both an aspect of video learning methodology and one of the primary benefits of learning from video, it would not be appropriate to try to measure adoption from the present study. This will need to be added to future studies.

Differences with experts. While initially, the differences in performance between experts and novices were not planned to be explored, they were the most significant outcome of this research. It would have been very useful to have more complete data about the gardening experience of all the participants in the study, and a more complete understanding of the background that individuals might have. In future research, more information can be collected about the area of expertise being called upon in the experimentation. This can be done by including more data collection during experimentation and perhaps by including a few detailed life interviews of villagers to help understand the subject conceptualization on the village level.

Implications

Contextualization reaches a larger population. One of the major implications of this research is that for a more general audience, a contextualized version of the video is better. It will be more successful for experts to learn from, while at the same time not making learning more difficult for novices. Furthermore, as the added complexity in the contextualized version does not affect learning negatively, on an economic level, it makes more sense to provide a version of the video that has more available information for the learners. Videos take time, energy, and money to create and distribute; if more information is just as easily available, it makes sense to include that additional information.

Guidelines for video creation. In creating educational videos, paying attention to the work associated with the learning from video does make the information in the video more accessible to the audience for which it is intended. There are four primary things to pay attention to: 1) Sensory load complexity- present information in multimodal presentations to aid learning, paying attention to the complexity of the information presented; 2) Extraneous Load—If it is distracting and/or unnecessary, remove it; 3) Information Coherence—Present the material in a simple, process-oriented explanation with procedural modeling to improve understanding; and 4) Contextualization—use contextual information and signaling to reduce misunderstanding and increase the shared understanding of the learning material within the ecocultural context that it is presented.

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APPENDIX A: COMPOSTING SCRIPT WITH KEY ELEMENTS

- Compost is a thing that can be added to the soil when you are planting. It will give weak soil strength and helps things grow big and strong. It gives plants the food they need.
- This video will teach you how to make compost to help in the growing of garden things and trees. This compost is good because it is strong, ready for use in just three weeks time.
- If you want to make this compost these are what you will need:
  5 Wheelbarrows of animal manure, 4 wheelbarrows of plant materials, 1 wheelbarrow of soil, 1 kg urea, 1liter vinegar, 1 kg sugar
- In this video we will be making a smaller amount of compost so we have divided everything by 3 to keep the amount even.
- The first step of the process is **to prepare the location for your compost pile[1].** It should be in the shade and free of rocks and debris.
- It is better if the pile is always in the shade because the small creatures in the soil that help the compost become strong fast will die if they are in the sun all of the time.
- **Animal manure[2]** is necessary for making compost**.** In this compost we use cow manure. We pound the manure to break it into small pieces so that later water mixes in well.
- Instead of cow manure, sheep, goat, and chicken manure are also very good. Horse or donkey manure are not very strong. Manure only needs pounding if the pieces are big, so cow manure needs pounding more than other types of manure.
- The manure is placed in a pile on the location chosen for the compost pile.
- **Topsoil is collected[3].** We do not want to dig very deep, where the soil is hard. We want the soil from the top layer only. This soil is sifted to remove stones and inorganic debris.
- We make very sure that plastic and batteries are not in the compost. They can poison the soil and make it hard for things to grow. Glass could cut us in the compost so we make sure to remove it as well.
- The cleaned soil is added to the manure pile.
- **Plant material[4]** is added to the pile. In this video we are using sawdust. It is important that the plant material is in small enough pieces so that water can get to the pieces of plant material. There are many types of plant materials that can be used for this.
- Leaves can be used. Groundnut shells are also good. The husks of rice or coos can also be used. Maybe you could even use parts of garden things not used in cooking. You can cut the pieces smaller if you need.
- The solid ingredients are all together. Now we make the liquid that will help the compost pile mix quickly and be very strong.
- We take the same amounts of **vinegar[5], sugar[6], and urea[7]** and put them in a bucket. Vinegar and sugar are easy to find at the shop. You will need to buy the urea at the market.
- If there is no urea at the market, you should collect urine in a plastic jug and save it to add to the compost. As urine ages in a plastic jug the smell goes away so it will not smell too bad. The urine is not as strong as the urea but it will still help.
- We add water and **mix them together[8]**
- The mixture is diluted with more water and put into a watering pot or bucket. **It is spread evenly on the whole pile[9].**

- We want all areas to get some of this mixture because it provides the food and the right environment for the things that help make this compost strong.
- **The compost is turned and mixed**[10] so that the manure, the soil, and the plant materials are distributed evenly.
- More water is added to the pile.
- More water being added to the pile and the pile being turned is continued until everything is **evenly mixed and wet enough**[11] that if you hold it in your hand it forms a mound.
- If there is too much water in the pile, it would kill the things that make the compost even and strong. If there is too little water, they will not be able to make the compost.
- **The pile is covered with plastic**[12] and the cover is held down with rocks. This keeps the pile from drying out too much and keeps animals from digging in the pile.
- If plastic sheets are hard to get, you could use rice bags or even cardboard to cover the pile. It is important to keep it a little wet and protected.
- This is a compost pile after it has been sitting for a week. If the compost is forming the way it is supposed to be forming, then when **a stick is put in the pile**[13], the tip of the stick will be hot from the things in the pile making the compost.
- If the tip of the stick isn't hot when you check it, the pile might have gotten too dry or been in the sun too much.
- After about three weeks the compost will be strong and ready to use. It can be mixed with topsoil and added to polypots for planting trees or it can be added to garden beds before planting. **This compost will help plants grow strong**[14]**.**

APPENDIX B: CONTEXTUAL ADDITIONS

Direct: The first step of the process is to prepare the location for your compost pile. It should be in the shade and free of rocks and debris.

Context 1- Shade: It is better if the pile is always in the shade because the small creatures in the soil that help the compost become strong fast will die if they are in the sun all of the time. (Type- reasoning)

Direct: Animal manure is necessary for making compost. In this compost we use cow manure. We pound the manure to break it into small pieces so that later water mixes in well.

Context 2- Manure: Instead of cow manure, sheep, goat, and chicken manure are also very good. Horse or donkey manure are not very strong. Manure only needs pounding if the pieces are big, so cow manure needs pounding more than other types of manure. (Type- variations)

Direct: Topsoil is collected. We do not want to dig very deep, where the soil is hard. We want the soil from the top layer only. This soil is sifted to remove stones and inorganic debris.

Context 3- Clean Soil: We make very sure that plastic and batteries are not in the compost. They can poison the soil and make it hard for things to grow. Glass could cut us in the compost so we make sure to remove it as well. (Type- reasoning)

Direct: Plant material is added to the pile. In this video we are using sawdust. It is important that the plant material is in small enough pieces so that water can get to the pieces of plant material. There are many types of plant materials that can be used for this.

Context 4-Plant Materials: Leaves can be used. Groundnut shells are also good. The husks of rice or coos can also be used. Maybe you could even use parts of garden things not used in cooking. You can cut the pieces smaller if you need. (Type- variation)

Direct: We take the same amounts of vinegar, sugar, and urea and put them in a bucket. Vinegar and sugar are easy to find at the store. You will need to buy the urea at the market.

Context 5- Urea: If there is no urea at the market, you should collect urine in a plastic jug and save it to add to the compost. As urine ages in a plastic jug the smell goes away so it will not smell too bad. The urine is not as strong as the urea but it will still help. (Type- variation)

Direct: The mixture is diluted with more water and put into a watering pot or bucket. It is spread evenly on the whole pile.

Context 6- Even Distribution: We want all areas to get some of this mixture because it provides the food and the right environment for the things that help make this compost strong. (Type- reasoning)

Direct: More water being added to the pile and the pile being turned is continued until everything is evenly mixed and wet enough that if you hold it in your hand it forms a mound.

Context 7- Water Balance: If there is too much water in the pile, it would kill the things that make the compost even and strong. If there is too little water, they will not be able to make the compost. (Type- reasoning)

Direct: The pile is covered with plastic and the cover is held down with rocks. This keeps the pile from drying out too much and keeps animals from digging in the pile.

Context 8- Pile Cover: If plastic sheets are hard to get, you could use rice bags or even cardboard to cover the pile. It is important to keep it a little wet and protected. (Type- variation)

Direct: This is a compost pile after it has been sitting for a week. If the compost is forming the way it is supposed to be forming, then when a stick is put in the pile, the tip of the stick will be hot from the things in the pile making the compost.

Context 9- Stick Temp: If the tip of the stick isn't hot when you check it, the pile might have gotten too dry or been in the sun too much. (Type- reasoning)

APPENDIX C: VIDEO TIME BREAKDOWNS

Direct Video Time and Description	Contextualized Video Time and Description	Script
[00:00.00] Start of Music with Logo on Screen	[00:00.00] Start of Music with Logo on Screen	
[00:18.07] Change to writing	[00:18.07] Change to writing	
[00:22.02] Change to picture of wheelbarrow full of compost (taken at Wellingara).	[00:22.02] Change to picture of wheelbarrow full of compost (taken at Wellingara).	All: Compost is a thing that can be added to the soil when you are planting. It will give weak soil strength and helps things grow big and strong. It gives plants the food they need.
[00:32.00] Fade to White	[00:32.00] Fade to White	
[00:32.17] Video of shoving compost (taken at Wellingara).	[00:32.17] Video of shoving compost (taken at Wellingara).	All: This video will teach you how to make compost to help in the growing of garden things and trees. This compost is good because it is strong, ready for use in just three weeks time. If you are wanting to make this compost these are what you will need:
[00:54.09] Fade to White	[00:54.09] Fade to White	
[00:54.20] Picture of pile of cow manure.	[00:54.20] Picture of pile of cow manure.	All: 5 Wheelbarrows of Animal Manure
[00:58.05] Picture of pile of sawdust with a bag of sawdust leaning on it.	[00:58.05] Picture of pile of sawdust with a bag of sawdust leaning on it.	All: 4 Wheelbarrows of plant materials
[01:01.21] Picture of cleaned soil in wheelbarrow.	[01:01.21] Picture of cleaned soil in wheelbarrow.	All: 1 Wheelbarrow of soil
[01:04.24] Picture of cup with urea pellets in the cup.	[01:04.24] Picture of cup with urea pellets in the cup.	All: 1 kg Urea
[01:07.22] Picture of three bottles of vinegar next to a bag of sugar.	[01:07.22] Picture of three bottles of vinegar next to a bag of sugar.	All: 1 liter vinegar, 1 kg Sugar
[01:17.21] Fade to Black	[01:17.21] Fade to Black	

Direct Video Time and Description	Contextualized Video Time and Description	Script
[01:18.16] Video of Bah2 patting cow manure in wheelbarrow.	[01:18.16] Video of Bah2 patting cow manure in wheelbarrow.	All: In this video we will be making a smaller amount of compost so we have divided everything by 3 to keep the amount even.
[01:20.05] Fade to White	[01:20.05] Fade to White	
[01:21.11] Video of Bah2 cleaning the location for the pile with Isatou watching.	[01:21.11] Video of Bah2 cleaning the location for the pile with Isatou watching.	All: The first step of the process is to prepare the location for your compost pile.
[01:29.05] Fade to White	[01:29.05] Fade to White	
[01:30.07] Video of same scene from closer in (needed to mix video for length issues).	[01:30.07] Video of same scene from closer in (needed to mix video for length issues).	All: It should be in the shade and free of rocks and debris. *Context: It is better if the pile is always in the shade because the small creatures in the soil that help the compost become strong fast will die if they are in the sun all of the time.*
[01:38.00] Fade to White	[01:47.03] Fade to White	
[01:38.25] Video of Bah2 pounding cow manure ends with Isatou about to shove manure.	[01:48.00] Video of Bah2 pounding cow manure and Isatou shoveling manure.	All: Animal manure is necessary for making compost. In this compost we use cow manure. We pound the manure to break it into small pieces so that later water mixes in well. *Context: Instead of cow manure, sheep, goat, and chicken manure are also very good. Horse or donkey manure are not very strong. Manure only needs pounding if the pieces are big, so cow manure needs pounding more than other types of manure).*
[01:54.20] Fade to White	[02:18.28] Fade to White	

Direct Video Time and Description	Contextualized Video Time and Description	Script
[01:56.00] Video showing Bah2 from behind pouring the wheelbarrow of pounded cow manure on the location previously cleaned.	[02:20.11] Video showing Bah2 from behind pouring the wheelbarrow of pounded cow manure on the location previously cleaned.	All: The manure is placed in a pile on the location chosen for the compost pile.
[02:05.16] Fade to White	[02:30.01] Fade to White	
[02:06.14] Video showing Bah2 shoveling topsoil into a wheelbarrow.	[02:30.19] Video showing Bah2 shoveling topsoil into a wheelbarrow.	All: Topsoil is collected. We do not want to dig very deep, where the soil is hard. We want the soil from the top layer only.
[02:14.18] Fade to White	[02:39.02] Fade to White	
[02:15.06] Video of Bah2 picking foreign objects out of the compost.	[02:39.27] Video of Bah2 picking foreign objects out of the compost.	All: This soil is sifted to remove stones and inorganic debris. *Context: We make very sure that plastic and batteries are not in the compost. They can poison the soil and make it hard for things to grow. Glass could cut us in the compost so we make sure to remove it as well.*
[02:23.23] Fade to White	[03:01.00] Fade to White	
[02:25.05] Video of Isatou emptying the topsoil from the wheelbarrow onto the pounded manure. Bah2 uses the shovel to empty the soil from the wheelbarrow.	[03:01.20] Video of Isatou emptying the topsoil from the wheelbarrow onto the pounded manure. Bah2 uses the shovel to empty the soil from the wheelbarrow.	All: The cleaned soil is added to the manure pile.
[02:34.15] Fade to White	[03:11.22] Fade to White	

Direct Video Time and Description	Contextualized Video Time and Description	Script
[02:35.03] Video of Isatou adding sawdust to a wheelbarrow. Bah2 smooths it out and then Isatou continues to pour.	[03:12.08] Video of Isatou adding sawdust to a wheelbarrow. Bah2 smooths it out and then Isatou continues to pour.	All: Plant material is added to the pile. In this video we are using sawdust. It is important that the plant material is in small enough pieces so that water can get to the pieces of plant material. There are many types of plant materials that can be used for this. *Context: Leaves can be used. Groundnut shells are also good. The husks of rice or coos can also be used. Maybe you could even use parts of garden things not used in cooking. You can cut the pieces smaller if you need.*
[03:00.03] Fade to White [03:01.12] Video of Bah2 pushing wheelbarrow to pile of dry ingredients and emptying the wheelbarrow.	[03:51.00] Fade to White [03:51.23] Video of Bah2 pushing wheelbarrow to pile of dry ingredients and emptying the wheelbarrow.	All: the solid ingredients are all together. Now we make the liquid that will help the compost pile mix quickly and be very strong.
[03:11.29] Fade to White [03:12.22] Video of Bah2 squatting by a bucket. He adds urea to the bucket.	[04:02.20] Fade to White [04:03.08] Video of Bah2 squatting by a bucket. He adds urea to the bucket.	All: We take the same amounts of vinegar, sugar, and urea and put them in a bucket.
[03:19.20] Video, no splice, of Bah2 adding sugar to a cup and then to the bucket, it mentions adding vinegar at this time but you do not see it because of video length issues.	[04:10.23] Video, no splice, of Bah2 adding sugar to a cup and then to the bucket and then adding a bottle of vinegar into the bucket.	All: Vinegar and sugar are easy to find at the bitik. You will need to buy the Urea at the market. *Context: If there is no urea at the market, you should collect urine in a bedongo and save it to add to the compost. As urine ages in a bedongo the smell goes away so it will not smell too bad. The urine is not as strong as the Urea but it will still help.*

Direct Video Time and Description	Contextualized Video Time and Description	Script
[03:30.00] Fade to White	[04:38.07] Fade to White	
[03:30.05] Video of Bah2 adding water to the cup and then to the bucket. Isatou stirs the mix and Bah2 pours water into the bucket.	[04:39.07] Video of Bah2 adding water to the cup and then to the bucket. Isatou stirs the mix and Bah2 pours water into the bucket.	All: We add water and mix them together
[03:41.01] Fade to White	[04:49.13] Fade to White	
[03:41.27] Video of a close-up of Bah2 filling the watering can with water from a cup.	[04:49.26] Video of a close-up of Bah2 filling the watering can with water from a cup.	All: The mixture is diluted with more water and put into a watering pot or bucket.
[03:54.05] Fade to White	[05:02.11] Fade to White	
[03:55.21] Isatou is watering the pile with the watering can.	[05:03.01] Isatou is watering the pile with the watering can.	All: It is spread evenly on the whole pile. *Context: We want all areas to get some of this mixture because it provides the food and the right environment for the things that help make this compost strong.*
[04:05.28] Fade to White	[05:23.09] Fade to White	
[04:06.20] Video of Bah2 mixing the pile. Isatou brings Bah2 a watering can full of water.	[05:23.25] Video of Bah2 mixing the pile. Isatou brings Bah2 a watering can full of water.	All: The compost is turned and mixed so that the manure, the soil, and the plant materials are distributed evenly.
[04:26.20] Fade to White	[05:43.28] Fade to White	
[04:27.00] Video of Bah2 adding water to the pile.	[05:44.21] Video of Bah2 adding water to the pile.	All: More water is added to the pile.
[04:47.21] Fade to White	[06:05.05] Fade to White	

Direct Video Time and Description	Contextualized Video Time and Description	Script
[04:48.16] Video of Bah2 pressing the compost pile together into a mound.	[06:05.23] Video of Bah2 pressing the compost pile together into a mound.	All: More water being added to the pile and the pile being turned is continued until everything is evenly mixed and wet enough that if you hold it in your hand it forms a mound. *Context: If there is too much water in the pile, it would kill the things that make the compost even and strong. If there is too little water, they will not be able to make the compost.*
[04:58.21] Fade to White	[06:25.03] Fade to White	
[04:59.13] Video of Isatou and Bah2 covering the pile in a tarp.	[06:25.20] Video of Isatou and Bah2 covering the pile in a tarp and adding rocks around the edge.	All: The pile is covered with plastic and the cover is held down with rocks.
[05:25.29] Fade to White	[06:59.17] Fade to White	
[05:27.08] Picture of Bah2 and Isatou standing by the pile covered in a tarp with rocks and bricks around the edges.	[07:00.12] Picture of Bah2 and Isatou standing by the pile covered in a tarp with rocks and bricks around the edges.	All: This keeps the pile from drying out too much and keeps animals from digging in the pile. *Context: If plastic sheets are hard to get, you could use rice bags or even cardboard to cover the pile. It is important to keep it a little wet and protected.*
[05:29.27] Fade to White	[07:03.18] Fade to White	
[05:30.19] Video of Bah2 putting a sick in a week old pile to test the breakdown.	[07:04.03] Video of Bah2 putting a sick in a week old pile to test the breakdown.	All: This is a compost pile after it has been sitting for a week.
[05:40.09] Fade to White	[07:13.28] Fade to White	

Direct Video Time and Description	Contextualized Video Time and Description	Script
[05:41.00] Video of Bah2 testing the pile and recovering it.	[07:14.13] Video of Bah2 testing the pile and recovering it.	All: If the compost is forming the way it is supposed to be forming, then when a stick is put in the pile, the tip of the stick will be hot from the things in the pile making the compost. *Context: If the tip of the stick isn't hot when you check it, the pile might have gotten too dry or been in the sun too much.*
[05:51.07] Fade to White	[07:28.25] Fade to White	
[05:51.26] Picture of Polypots.	[07:29.12] Picture of Polypots.	All: After about three weeks the compost will be strong and ready to use. It can be mixed with top soil and added to polypots for planting trees
[06:02.15] Fade to White	[07:39.24] Fade to White	
[06:03.05] Video of Sam Demba spreading compost on a garden bed in Wellingara.	[07:40.12] Video of Sam Demba spreading compost on a garden bed in Wellingara.	All: or it can be added to garden beds before planting. This compost will help plants grow strong.
[06:12.22] Picture of Video Griot Logo	[07:50.22] Picture of Video Griot Logo	
[06:34.26] End of Video	[08:13.07] End of Video	

APPENDIX D: ORIGINAL INTERVIEW SCRIPT

Qualifying information:

Do you Speak Mandinka? (Must Answer Yes) • I ka Mandinka kango fo le bang?
Are you from the rural area? (Must be rural). • I bota santoto bang?
Can you read a book? (Must answer no). • I ka bukoo karan no?
Some people prepare compost. Can you prepare compost (Must be no).
• Mo dolu ka jambandodeda. Iye jambandodeda no, le bang?

Verbal agreement to be part of the study.

Collect demographic information.

How old are you? • Iye sanji jelu le soto?
Who are your people (what is your tribe)? • Ite mu mun se le ti?
What village are you from? • I bota satejuma?
What is your school history? • Mune mu ila karango tariko ti?

Watch video.

Record reteaching of information.

Pretend that you are teaching your neighbor how to make compost. Teach it to me.
• Ifan ke komin I be ila siño karende I ka jambandodeda namin. N Karandi.
If you going to use rice stalks in the preparing of compost, what would change?
• Nin I ya tara ye muna fung mani namoo la ka jambandodeda, mune be falingla?
If you have two wheelbarrows of plant materials, how are you going to prepare the compost?
• Ni ya tara iye puspus fula dammaa le soto fengolu mim bota yiroolu warang fi fengolu bala, I be jambando nin dedala nadii?

Questions about attitudes toward video.

What other subjects do you think would be good for videos?
• Ya mira munvideo sefa le be betiala koteng pur Gambiankolu? Misalfe I ka lohati deda namin waranto kanijio.
If you could share this video with someone, whom would you want to show it to?
• Nin I lafita nin video yitandila mo la, a be ke la juma le ti?
What part of the video was most helpful?
• Iye video min jube, a mafung juma leya nafa soto iye baaki?
Which part was easiest to learn? Why?
• Mafong juma le karango sonoyata ife? Muna tina?
If this video wasn't here, how else could you learn about composting?
• Nin video te jan nun, I be karan na nadii jambando ka deda namin?
What about videos made them bad or good to learn from?
• Ya mira ka karango ke videola abetiata le bang? Muna tina iye wo mira?
Why would video education be useful in The Gambia?
• Muna tina ka molu karandi nin videola iye nafa soto pur Gambia?

Thank participants. Compensate.

***Note**: The Mandinka transliteration used with this script is not an accurate guide for Mandinka spelling. It was the agreed upon method of transliteration for this collaborative project.

APPENDIX E: MODIFIED INTERVIEW SCRIPT

Qualifying information

- Do you Speak Mandinka? (Must Answer Yes)
- Are you from the rural area? (Must be rural).
- Can you read a book? (Must answer no).
- Initial*: Some people prepare compost. Can you prepare compost? (Must be no). (Later not included as qualifying question)

Demographic Information.

- How old are you?
- Who are your people (what is your tribe)?
- What village are you from?
- What is your school history?
- Not Included Initially: What do you know about preparing compost?

Watch the Video
Reteaching Question

- Pretend that you are teaching your neighbor how to make compost. Teach it to me.

Transfer Questions

- If you going to use bara namoo in the preparing of compost, what would change?
- If you have one half a wheelbarrow of animal manure, how are you going to prepare the compost?

Attitude Questions

- How much is your want on making this compost?
- Why do you think this video is useful?
- With this video that you watched, how many times would you need to see it before you knew all the information?
- If this video wasn't here, how else could you learn about composting?
- If you could share this video with someone, whom would you want to show it to?
- What about videos made them bad or good to learn from?
- Why would video education be useful in The Gambia?

* Later not included as qualifying question because of participant recruitment adjustments.